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nationalgrid

Bramford to Twinstead Tee Connection Project

Selection of Preferred Corridor

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1 INTRODUCTION

Purpose of report

1.1 This report outlines the selection of a preferred corridor for a proposed 400kV overhead transmission line connection between Bramford substation (near Ipswich, Suffolk) and Twinstead Tee (near Sudbury, Suffolk). It demonstrates how statutory duties, policy considerations, technical and environmental issues and consultation feedback have shaped and influenced the selection of the preferred corridor.

1.2 The report is structured as follows :

- Chapter 2 - explains the background to the proposal, including the need for the connection. It also outlines how potential reinforcement alternatives were identified and assessed and reports responses to some of those alternatives, reaching a conclusion on the preferred form of connection;
- Chapter 3 - describes the potential corridors that were evaluated. These formed the basis for the Stage 1 Consultation, which is reviewed in more detail in Chapter 9;
- Chapter 4 - identifies those factors which have been taken into account in the route corridor selection process;
- Chapter 5 - discusses other factors which were considered not to affect corridor selection;
- Chapters 6 to 16 - assess the potential corridors against each of the factors in Chapter 4 and note related consultation representations;
- Chapter 17 - discusses potential mitigation measures, particularly the use of underground cables;
- Chapter 18 - contains an overview of the relative merits of the corridors and provides a basis for selecting a preferred corridor, with reference to consultation representations which have influenced that selection;
- Chapter 19 - sets out the conclusions of the report;
- Chapter 20 - outlines the next steps, including how a detailed connection design will be identified and environmental impact assessment and

further consultations undertaken, leading to the preparation and submission of an application for development consent to the Infrastructure Planning Commission (IPC) or its successor body.

1.3 Reference is made to a number of separate but related project-specific reports which can be read alongside this Selection of Preferred Connection report – the Project Need Case[1], the Strategic Optioneering Report[2], the Review of Strategic Options report[3], the Route Corridor Study Report[4] and the Stage 1 Feedback Report[5].

2 BACKGROUND TO THE PROPOSAL

National Grid

2.1 National Grid is the operator of the high-voltage transmission system for the whole of Great Britain and the owner of the high voltage transmission network in England and Wales[6].

2.2 National Grid's transmission system in England and Wales consists of approximately 7,200km of overhead lines and a further 700km of underground cabling, operating at 400kV and 275kV. 400kV lines are at the higher voltage giving them a higher power carrying capability, while 275kV lines generally represent the older parts of the network which were established prior to the 400kV transmission system.

2.3 The overhead lines and cables connect around 340 substations to form a highly interconnected network. The substations provide points of connection for around 80 power stations and for connections to the local distribution networks, which operate at voltages from 132kV down to 240V (at which voltage, the power is distributed to domestic consumers). The distribution networks are

[1] National Grid : Bramford to Twinstead Connection : Need Case for the East Anglia Region : June 2011
[2] National Grid : Bramford to Twinstead 400kV Overhead Line Project Strategic Optioneering Report : October 2009
[3] National Grid : Bramford to Twinstead Tee Connection East Anglia : Review of Strategic Options : June 2011
[4] TEP : Bramford to Twinstead 400kV overhead line project : Route Corridor Study for Public Consultation : October 2009
[5] National Grid : Bramford to Twinstead Tee Connection Project : Feedback Report on Stage 1 Consultation : June 2011
[6] The transmission network in Scotland is owned by Scottish Power Transmission Limited in southern and central Scotland and by Scottish Hydro-Electric Transmission Limited in the north of Scotland.

owned by Distribution Network Operators (DNOs), including UK Power Networks (hereafter referred to as UKPN) in East Anglia.

2.4 National Grid has duties placed upon it by the Electricity Act 1989[7] ('the Electricity Act') and operates under the terms of its transmission licence. Those duties and terms of particular relevance to the development of the proposed connection described in this report are set out below.

Duties under the Electricity Act 1989

2.5 Under Section 9(2) of the Electricity Act, National Grid has a duty:

- to develop and maintain an efficient, co-ordinated and economical system of electricity transmission; and
- to facilitate competition in the supply and generation of electricity.

2.6 Section 38 and Schedule 9 of the Electricity Act require National Grid, when formulating proposals for new lines and other works, 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 shall do what [it] reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects*".

2.7 In its Stakeholder, Community and Amenity policy[8], National Grid sets out how the company will meet the duty placed upon it by the aforementioned legislation. This includes :

- only seeking to build new lines and substations where the existing transmission infrastructure cannot be upgraded to meet transmission security standards;

[7] Electricity Act : 1989 c29
[8] National Grid plc : National Grid's commitments when undertaking works in the UK - our Stakeholder, Community and Amenity Policy : February 2010

- seeking to avoid nationally and internationally designated areas where new infrastructure is required; and
- minimising the effects of new infrastructure on other sites valued for their amenity.

2.8 The Stakeholder, Community and Amenity Policy also commits to the application of best practice methods, to assess the environmental impacts of proposals and identify appropriate mitigation measures, and to promoting effective stakeholder and community engagement.

Transmission licence

2.9 Licence Condition C8 (Requirement to offer terms) sets out obligations on National Grid regarding provision of offers to provide connections to the transmission system. In summary, where any person applies for a connection, National Grid shall offer to enter into an agreement(s)[9] to connect, or to modify an existing connection, to the transmission system and the offer shall make detailed provision regarding:

- the carrying out of works required to connect to the transmission system;
- the carrying out of works (if any) in connection with the extension or reinforcement of the transmission system; and
- the date by when any works required to permit access to the transmission system (including any works to reinforce or extend the transmission system) shall be completed.

2.10 Licence Condition C17 (Transmission system security standard and quality of service) requires National Grid to "*at all times: plan, develop and operate the licensee's transmission system … in accordance with the National Electricity Transmission System Security and Quality of Supply Standard version 2.1*" (NETS SQSS)[10].

2.11 The NETS SQSS is a document that defines criteria which specify the robustness of the transmission system, in terms of the faults, and combinations of faults,

[9] Paragraph 6 of Licence Condition C8 sets out exceptions where National Grid is not obliged to make an offer e.g. where to do so would put it in breach of certain other contracts or regulations.
[10] NETS Security and Quality of Supply Standard Issue 2.1 - 07 March 2011

that it must be able to withstand without any interruption of supplies, and the maximum interruption to supplies which is permitted for certain more onerous combinations of faults. The NETS SQSS is subject to updates through industry and regulatory working groups, with this periodic review approved by the industry regulator, Ofgem.

The Need for the Connection

2.12 The need for the connection is set out in the Project Need Case[11] which explains in detail the current capacity of the transmission system and the requirement to add new capacity from 2016. This will be periodically reviewed to reflect changes to contracted generation.

2.13 The existing transmission system in East Anglia is sufficient to comply with the NETS SQSS for current levels of generation and demand. However, a substantial amount of new generation is planning to connect within the region over the next few years.

2.14 The Need Case explains that two technical limits exist within the current system. These two limits associated with Thermal ("physical ability to transfer power") and Stability ("generator transient stability") each restrict the amount of electricity that can be safely and securely transmitted which in turn limits the volume that can be generated.

2.15 The Need Case also explains that the technical limits of the existing transmission infrastructure will be breached over the next few years as new power stations connect to the transmission system and that to maintain compliance with the NETS SQSS, additional transmission capacity in the region is required. Specifically, by 2016 the transmission system infrastructure in East Anglia will not be compliant with the NETS SQSS and based on contracted generation additional transmission capacity in excess of 8000MW is required.

[11] National Grid : Bramford to Twinstead Connection : Need Case for the East Anglia Region : May 2011

Scheme Development and Consultation Process

2.16 Developing a scheme to meet the demands for additional capacity in the East Anglian transmission network involves the following main stages :

- power system analysis - to identify issues which may affect the secure operation of the National Grid transmission system, and optimal strategies for their management, as set out in the Need Case;
- strategic optioneering - to determine potential solutions to take forward for more detailed investigation, having regard to National Grid's statutory duties;
- route corridor studies - to define potential corridors, taking environmental constraints into account;
- Stage 1 Consultation - to obtain the views of statutory bodies, other agencies and the general public on the potential corridors;
- corridor preference (the subject of this report) - to select which corridor should be preferred, based on a range of technical, environmental and other criteria, including representations received during the Stage 1 Consultation;
- detailed connection design - definition of potential route alignment(s) and pylon and substation locations and consideration of undergrounding and other mitigation techniques within the preferred corridor;
- Stage 2 Consultation - to obtain the views of statutory and non-statutory bodies, other agencies and the public on preliminary environmental information and in developing the detailed connection design and appropriate mitigation measures;
- assessment - environmental impact assessment of the detailed connection design and finalisation of proposed scheme;
- Stage 3 Consultation - to consult on the proposed detailed connection design in accordance with the Planning Act 2008 to obtain the views of statutory and non-statutory consultees, other agencies, and the public prior to the submission of an application for development consent to the IPC;
- submission - submission of Development Consent Order application to the IPC, or successor body.

Strategic optioneering

2.17 Strategic optioneering is informed by system studies, undertaken within National Grid, to identify a wide range of technical reinforcement options which could potentially meet the strategic requirement for additional transmission capacity, taking account of existing and planned generation and demand forecasts. In the case of the Bramford to Twinstead Tee Connection Project, the initial strategic optioneering exercise identified and evaluated some 18 technical options at workshops involving representatives of the systems development, engineering and consents teams from National Grid and its alliance partners. In evaluating the options, due regard was given to the criteria (as set out in National Grid's statutory and licence obligations) of economy, efficiency (including system compliance and deliverability) and to National Grid's obligations to consider the effects of any proposal on the environment.

2.18 In July 2009, early discussions were held with the relevant local planning authorities (Suffolk and Essex County Councils and Mid Suffolk, Babergh, Suffolk Coastal and Braintree District Councils) and the Dedham Vale and Stour Valley AONB Partnership to explain the background and need for the system reinforcements and to discuss strategic connection options available to National Grid.

2.19 The original strategic optioneering exercise, reported in October 2009, concluded that two broad options should be taken forward to Route Corridor Studies, involving different forms of overhead line connection between Bramford and Twinstead Tee. National Grid initially considered whether a connection could be achieved by means of an overhead line. This was because of the very high cost of high voltage underground transmission coupled with certain environmental and operational disadvantages associated with undergrounding. The Stage 1 Consultation did not seek views on this issue, but representations revealed significant aspiration for the undergrounding of all or part of the Bramford to Twinstead Tee connection, in order to avoid impacts on the landscape and local views. Further consideration was therefore given to this matter, as described in Chapter 17.

2.20 Issues relating to strategic options, which were raised by these authorities, and by others during the Stage 1 Consultation, are considered in the Stage 1 Feedback Report and in the Review of Strategic Options Report. The latter was

undertaken to test the robustness of the strategic optioneering taking account of the latest background information and consultation representations. In particular these documents provide more information on the scope for using subsea cables and underground technology.

Route Corridor Study

2.21 Having identified, through the consideration of strategic alternatives, that a new 400kV connection is needed between Bramford and Twinstead Tee, a Route Corridor Study was commissioned from environmental consultants TEP to identify possible corridors between the connection points at Bramford and Twinstead Tee and to assess how these performed against National Grid's statutory environmental obligations. A detailed desk based assessment, supplemented with site visits, was used to generate potential corridors, in particular considering the potential impacts on the main environmental constraints within the study area.

2.22 The Route Corridor Study identified four corridors and offered a comparison of them. In addition, it considered issues associated with the paralleling of overhead lines and the impacts of re-using existing overhead line routes. The Route Corridor Study is separately reported.

Stage 1 Consultation

2.23 The findings of the Route Corridor Study formed the basis for an extensive consultation exercise. This was carried out in accordance with the project's initial Statement of Community Consultation[12] (SOCC) which was prepared in consultation with Babergh District Council, Mid Suffolk District Council, Suffolk Coastal District, Braintree District Council, Uttlesford District Council, Suffolk County Council and Essex County Council and takes account of their comments. It was informed by relevant government guidance[13], guidance produced by the Infrastructure Planning Commission[14] , the relevant local authorities' Statements

[12] National Grid : Bramford to Twinstead 400kV overhead line project : Statement of Community Consultation : October 2009
[13] Department of Communities and Local Government : Planning Act 2008 Consultation on the Pre-Application Consultation and Application Procedures for Nationally Significant Infrastructure Projects : March 2009
[14] subsequently incorporated in Infrastructure Planning Commission : Guidance Note 1 : Pre-application stages : March 2010

of Community Involvement and National Grid's policy and experience relating to public consultation.

2.24 The consultation on corridor options was carried out between 27 October 2009 and 28 February 2010 and included :

- a series of manned public exhibitions at 20 venues in the local area;
- project briefing meetings with Town and Parish Councils;
- project briefing meetings with members and officers of the local authorities;
- consultation with a wide range of statutory and non-statutory organisations including the Environment Agency, Natural England, English Heritage.

2.25 A common issue raised in consultation representations was the need for more information relating to the use of off-shore connections and underground cabling to supplement that provided in the Strategic Optioneering Report 2009. An additional communications programme was therefore implemented during June and July 2010 which included five further public information events and information dissemination, specifically related to these issues.

2.26 A separate detailed Stage 1 Feedback Report presents the issues raised in the Stage 1 Consultation. Both the Stage 1 Feedback Report and the present report show how consultation representations have been taken into account in selecting a preferred corridor.

Review of strategic options

2.27 As part of the pre-application process adopted by National Grid, a review of the strategic options was undertaken, taking into account the issues raised during the Stage 1 Consultation, and in the context of the changes to the content and programme of new generation in East Anglia since the original strategic optioneering exercise. The review tested whether, on the basis of the latest available information, the selection of a connection option based upon the provision of a new overhead transmission line between Bramford and Twinstead Tee was robust.

2.28 The review is documented in the Review of Strategic Options Report (June 2011) which:

- reviews the technology options available to meet the identified need for system reinforcement, including the use of the following technologies : AC underground cables and overhead lines; gas insulated lines; and HVDC technology;
- provides updated information on the capital costs of each connection option and considers lifetime cost implications; and
- considers the environmental and socio-economic effects of each option.

2.29 The Need Case document explains the transmission capacity issues in the region and the Review of Strategic Options Report determined that the following broad options were capable of addressing these issues :

- Sizewell – Bradwell undersea cable;
- Bramford – Twinstead Tee;
- Bramford – Braintree;
- Bramford – Rayleigh.

2.30 Options for connections between Bramford and Burwell and between Sizewell and Walpole via Norwich would not achieve the increased transmission system capacity required. Options for connections between Sizewell and Twinstead Tee (avoiding Bramford) and between Bramford and Pelham (avoiding Twinstead Tee) were discounted because each would be significantly longer than another viable option which would achieve similar transmission system capacity benefits.

2.31 There are a number of different technologies by which the required transmission connection could be made :

- Alternating current (AC) overhead transmission lines;
- AC underground cable circuits;
- AC gas insulated lines (GIL);
- High voltage direct current (HVDC) cables and overhead lines.

2.32 These technologies have different features which affect when and where they are used and not all are appropriate for use on certain of the proposed

connections. The full list of options and each applicable technology are set out in the table below :

Table 2.1 : Technology options for potential connections

Technology	Potential connections			
	Sizewell – Bradwell Subsea	**Bramford - Twinstead Tee**	**Bramford - Braintree**	**Bramford – Rayleigh**
AC underground cables	Yes (subsea cable)	Yes	Yes	No
Gas insulated line	No	Yes	Yes	No
HVDC	Yes (subsea cable)	No	No	No
AC overhead line	No	Yes	Yes	Yes

2.33 GIL and underground cable solutions have not been assessed for the Bramford to Rayleigh option because the length of route would be greater than for a Bramford to Braintree option without achieving a significant increase in benefits.

2.34 The comparative capital costs of the connection options and reinforcements required to meet the needs of the NETS SQSS are shown in Table 2.2. In addition to the cost of the connection itself, these costs include for the new and upgraded substations, the upgrading of existing transmission assets and the provision of additional circuits required in connection with each system enhancement option.

Table 2.2 : Capital costs of potential system enhancement options

Potential connection	Technology	Capital cost £m
Sizewell - Bradwell	HVDC cables (subsea)	1899
Sizewell - Bradwell	AC cables (subsea)	2666
Bramford - Twinstead Tee	AC overhead line	545[15]
Bramford - Twinstead Tee	AC cables	1129
Bramford - Twinstead Tee	Gas insulated line	1133
Bramford - Braintree	AC overhead line	556
Bramford - Braintree	AC cables	1260
Bramford - Braintree	Gas insulated line	1270
Bramford - Rayleigh	AC overhead line	719

2.35 In addition, lifetime costs have been calculated for each of the connections (excluding other elements of the system enhancement options). These are shown in Table 2.3 and include for the value of lifetime transmission losses and maintenance.

Table 2.3 : Costs of connection (only) options[16]

Potential connection	Technology	Capital cost £m	Lifetime cost £m
Sizewell - Bradwell	HVDC cables (subsea)	1475	2192
Sizewell - Bradwell	AC cables (subsea)	2210	2530
Bramford - Twinstead Tee	AC overhead line	66	199
Bramford - Twinstead Tee	AC cables	690	751
Bramford - Twinstead Tee	Gas insulated line	696	760
Bramford - Braintree	AC overhead line	118	204
Bramford - Braintree	AC cables	823	882
Bramford - Braintree	Gas insulated line	832	849
Bramford - Rayleigh	AC overhead line	189	435

[15] Adopting the DNO route would add approximately £30m
[16] costs are those related to 1) AC cables and shunt reactors 2)HVDC cables and converters 3) overhead lines only 4) gas insulated lines only

2.36 The Review of Strategic Options report considered that it was not possible to differentiate between the options on the basis of socio-economic factors.

2.37 The considerable costs associated with the Sizewell to Bradwell subsea options, coupled with potential impacts on European protected sites and Sites of Special Scientific Interest in the Blackwater Estuary and the need to reconstruct the 38km Bradwell to Rayleigh overhead line and, in the case of an HVDC connection, the need to site a converter station in or close to the nationally designated landscape of the Suffolk Coast and Heaths AONB and Heritage Coast, lead to the conclusion that such options should not be recommended. There are also technical risks associated with an HVDC option.

2.38 The Bramford to Braintree and Bramford to Rayleigh overhead line options would be longer (and therefore more expensive) than a Bramford to Twinstead Tee option. Both routes potentially would involve longer sections crossing or running close to the boundary of the Dedham Vale AONB than the latter and would therefore offer no environmental benefits in terms of impact on this designated landscape. The Bramford to Braintree option would also involve crossing the Colne Valley. The Bramford to Rayleigh option could impact upon the Stour and Orwell Estuaries Ramsar site, SPA and SSSI. It is unlikely that a route could avoid crossing SSSIs south of Colchester. It would also pass close to the built-up area of Colchester and be constrained by development to the south east of Colchester. While both options would result in the removal of the tee point and a section of overhead line south of Twinstead Tee it is considered that such benefits would not outweigh the environmental disadvantages.

2.39 For both forms of underground transmission for a Bramford to Twinstead Tee connection, the lifetime costs associated with the connection alone (without considering wider reinforcements) would be over £550m more than those associated with an overhead line solution. Greater cost differentials would be associated with the use of underground technology for a Bramford to Braintree option.

2.40 This review confirmed that constructing an overhead transmission line between Bramford and Twinstead Tee would best meet National Grid's technical, economic and environmental obligations and should be the preferred option to take forward for further investigation, taking National Grid's statutory duties into account.

3 ROUTE CORRIDORS

Potential Route Corridors

3.1 Four broad corridors between Bramford and Twinstead Tee which were identified by the Route Corridor Study are shown on Figure A :

- one parallel to the existing 400kV overhead line (Corridor 1);
- one using the route of the existing 132kV line between Bramford and Twinstead Tee (Corridor 2); and
- two corridors for entirely new routes to the north of Hadleigh (Corridors 3 and 4).

Corridor 1

3.2 Corridor 1 would involve the construction of a new 400kV overhead line parallel to the existing 400kV overhead line which runs from Bramford to Twinstead Tee. The corridor is 26 km in length and runs southwest from Bramford substation following the existing 400kV overhead line to the north of Burstall and Hintlesham, continuing south of Hadleigh and Polstead Heath. West of Hintlesham the corridor also runs broadly in parallel with an existing 132kV overhead line. The corridor continues to Twinstead Tee passing through the Area of Outstanding Natural Beauty south of Boxford. The corridor extends to both sides of the existing line. The latest guidance[17] on working close to live power lines suggests that the minimum distance between the existing line and circuits on a new line would be 75m.

3.3 Corridor 1 passes through two of Suffolk County's district council areas - Mid Suffolk and Babergh District Council - and the constituencies of Central Suffolk & North Ipswich and South Suffolk. As the corridor approaches Twinstead Tee, it enters the County of Essex and the District Council area of Braintree.

[17] Health and Safety Executive : Guidance note GS6 - Avoidance of danger from overhead electric power lines (Third edition) : 1997

Corridor 2

3.4 Corridor 2 proposes the adoption of the route of a 132kV overhead line comprising part of the electricity distribution system under the control of the Distribution Network Operator UKPN. This overhead line runs from Burstall Bridge, 2.5km to the south of Bramford substation, to Pelham via Twinstead Tee. Two options for the eastern end of Corridor 2 were identified and will be given further consideration should Corridor 2 be selected. Corridor 2A is 28.5 km in length and runs due south from Bramford substation passing the outskirts of Burstall before picking up the route of the existing 132kV overhead line at Burstall Bridge and turning west to run to the south of Hintlesham. Corridor 2B is 27km in length and runs south west from Bramford substation, passing to the north of Hintlesham village before joining the route of the existing 132kV overhead line about 2km west of Hintlesham. From here Corridor 2 runs parallel with Corridor 1 with only one small variation as the 132kV overhead line approaches Twinstead Tee. The corridor passes through the Area of Outstanding Natural Beauty south of Boxford. Adopting either Corridor 2A or 2B would involve removing the 132kV overhead line between Burstall Bridge and Twinstead Tee.

3.5 Corridor 2 passes through two of Suffolk County's district council areas - Mid Suffolk and Babergh District Council - and the constituencies of Central Suffolk & North Ipswich and South Suffolk. As Corridor 2 approaches Twinstead Tee it enters the County of Essex and the District Council area of Braintree.

3.6 Discussions with UKPN have confirmed that, if this corridor were to be used, resulting in the removal of the 132kV overhead line between Bramford and Twinstead Tee, a new grid supply point substation would need to be provided west of Twinstead Tee to maintain electricity supplies. Early studies have identified potential sites close to the overhead line between Twinstead Tee and Castle Hedingham, which are situated within the administrative areas of Essex County Council and Braintree District Council. Further consideration of substation site options would take place if Corridor 2 is selected and would form part of the Stage 2 Consultation.

Corridor 3

3.7 Corridor 3 is 26.5 km in length and runs in a south westerly direction from Bramford substation before turning due west to pass to the north of Hadleigh. After Hadleigh the route turns south westerly passing to the north of Boxford and south of Little Cornard before reaching Twinstead Tee. The corridor avoids the Area of Outstanding Natural Beauty.

3.8 Corridor 3 passes through two of Suffolk County's district council areas - Mid Suffolk and Babergh District Council and the constituencies of Central Suffolk & North Ipswich and South Suffolk. As Corridor 3 approaches Twinstead Tee it enters the County of Essex and the District Council area of Braintree.

Corridor 4

3.9 Corridor 4 is 30 km in length and runs northwest from Bramford substation passing to the east or west of the village of Flowton before turning due west to pass to the north or south of the village of Semer. At Semer the corridor turns southwest to Twinstead Tee. The corridor avoids the Area of Outstanding Natural Beauty.

3.10 Corridor 4 passes through two of Suffolk County's district council areas - Mid Suffolk and Babergh District Council and the constituencies of Central Suffolk & North Ipswich and South Suffolk. As Corridor 4 approaches Twinstead Tee (East of Newton) it follows along the same alignment as Corridor 3 and enters the County of Essex and the District Council area of Braintree.

Initial assessment of route corridors

3.11 It would be technically feasible to construct an overhead line in any of these corridors.

3.12 As noted above, Corridor 2 would require the construction of a grid supply point substation, west of Twinstead Tee. Siting studies[18] were undertaken to determine potential locations for such a substation. The work undertaken to

[18] National Grid : Bramford to Twinstead 400kV overhead line project : Draft Substation Siting Study : Executive Summary : October 2009

date was described in a draft report which was made public as part of the Stage 1 Consultation exercise.

3.13 The Route Corridor Study concluded that the AONB is the area of greatest constraint in the study area. If no overhead lines were already present in the area, then overhead line routeing practice (consistent with planning policy) would seek to avoid this designation and would indicate a route to the north of the AONB (Corridors 3 or 4). It identified the presence of the existing 132kV and 400kV lines running through the AONB as an opportunity to reduce the scale of change that a new overhead line would bring to the study area (Corridor 2).

3.14 The Route Corridor Study stated that Corridor 4 was the least environmentally constrained, making reference to the environmental constraints mapped in the study. This assessment is a direct consequence of Corridor 4 having been identified specifically to avoid the mapped constraints as far as possible. The Route Corridor Study had considered only environmental factors whereas corridor selection also needs to consider other factors. Early consultations were held with the local authorities and statutory consultees to gain their views on the main issues for each corridor, as part of a continuing dialogue with these bodies. The local authorities stressed the importance of taking consultation representations into account before reaching a decision on the preferred corridor.

4 FACTORS EMPLOYED IN EVALUATING CORRIDORS

Introduction

4.1 This section of the report explains why certain factors have been taken into account in evaluating the corridor preferences for a connection between Bramford and Twinstead Tee. The selection of these factors has been influenced by:

- the requirements of the Planning Act 2008 and associated Regulations;
- National Grid's statutory duties;
- planning policy;
- National Grid's own policies.

4.2 A number of other factors were considered in preparing for the evaluation (including some put forward by respondents to the Stage 1 Consultation), but were scoped out for various reasons. These factors are discussed in Chapter 5.

Planning Act 2008

4.3 It is relevant to consider the issues to which the IPC and the Secretary of State must have regard in determining an application for development consent by virtue of Sections 104 and 105 of the Planning Act 2008[19]. In summary, these are :

- any relevant national policy statement;
- any local impact report;
- any matters prescribed by regulations;
- any other matters which the decision maker considers to be "*both important and relevant to the decision*".

4.4 At the stage of selecting a preferred corridor, national policy statements have yet to be adopted (the versions before Parliament for approval are discussed in Chapter 7). Nor have local impact reports been produced by the local authorities through whose areas a corridor may pass. Their planning policies are a matter of record and the authorities have also made their views known through the Stage 1 Consultation process.

4.5 The Infrastructure Planning (Decisions) Regulations 2010[20] sets out regulations regarding issues which must be taken into account by decision makers in certain circumstances. Regulations 3 and 7 are relevant to the current proposal. Regulation 3 states that the decision maker shall have regard to the desirability of:

- preserving Listed Buildings or their setting or any features of special architectural or historic interest which they possess;
- preserving or enhancing the character or appearance of Conservation Areas;

[19] Planning Act 2008 : 2008 Ch 29
[20] Infrastructure Planning (Decisions) Regulations 2010 : SI 2010 No.305

- preserving Scheduled Monuments or their settings.

4.6 Regulation 7 states that the decision maker shall have regard to the United Nations Environment Programme Convention on Biological Diversity[21], one of whose objectives is the conservation of biological diversity.

4.7 No other matters had been prescribed by Regulations at the time of the production of this report.

4.8 The Planning Act 2008 requires applicants to undertake public consultation with people living in the vicinity of proposed works in advance of any Development Consent Order application and to explain how relevant representations from the consultations have influenced the proposal that goes forward for determination. The responses to the Stage 1 Consultation are referenced in the following chapters of the report, with key issues discussed further in Chapter 9.

Statutory Duties

4.9 Section 9 of the Electricity Act 1989 places an obligation on National Grid to develop and maintain an efficient, co-ordinated and economical system of electricity transmission. In addition, Section 38 and Schedule 9 of the Act requires National Grid to give consideration to the impact of its works on amenity by having 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*".

4.10 These legal duties provide an important framework within which the preferred corridor is to be selected. They are addressed in Chapter 6 (efficiency/co-ordination and economy) and in Chapters 10 to 13 (impacts on amenity). Deliverability is fundamental to the timely provision of necessary infrastructure in furtherance of statutory responsibilities and is dealt with in Chapter 14.

[21] United Nations Environment Programme : Convention on Biological Diversity : December 1993

Planning Policy

4.11 As noted above, the IPC is obliged to determine applications in accordance with the prevailing National Policy Statements. In the absence of adopted NPS, as is currently the case, decisions on applications will rest with the Secretary of State.

4.12 The overarching NPS for energy[22] before Parliament for approval notes that " *Other matters that the IPC may consider both important and relevant to its decision making may include Development Plan Documents or other documents in the Local Development Framework. In the event of a conflict between these or any other documents and an NPS, the NPS prevails for purposes of IPC decision making given the national significance of the infrastructure*."

4.13 Planning Policy Guidance notes and Planning Policy Statements published by the Government, and development plans adopted by local authorities are therefore considered to be material considerations. Planning policy is addressed in Chapter 7 of this report.

4.14 The overarching NPS for energy requires the IPC to take account of adverse environmental, social and economic impacts and weigh these against the benefits of the proposal (which for the Bramford to Twinstead Tee Connection Project are set out in the Need Case and Review of Strategic Options Report). It identifies the generic issues which should be taken into account in assessing applications for development consent, recognising that these are the issues which are likely to arise most frequently but that they are not equally applicable to all projects. Where generic issues have been scoped out in the current exercise, this is noted in the list below and further information is provided in Chapter 5. The NPS for electricity networks[23] before Parliament for approval identifies a number of issues specific to proposals for network development. The generic issues include :

- air quality and emissions (scoped out at this stage, see Chapter 5);

[22] Department for Energy and Climate Change : Overarching Energy National Policy Statement : Version for Approval : June 2011
[23] Department for Energy and Climate Change : National Policy Statement for Electricity Networks Infrastructure : Version for Approval : June 2011

- biodiversity and geological conservation, noting particularly the effects on designated sites. The NPS for electricity networks seeks information on the impacts on birds and their flight paths;
- civil and military aviation and defence interests;
- coastal change (scoped out at this stage, see Chapter 5);
- dust, odour, artificial light, smoke, steam and insect infestation (scoped out at this stage, see Chapter 5);
- flood risk and climate change resilience;
- historic environment, noting particularly the effects on designated sites;
- landscape and visual impacts, noting particularly the effects on nationally designated landscapes. The NPS for electricity networks promotes the use of the Holford Rules and outlines the IPC's approach to the consideration of undergrounding;
- land use, including open space, green infrastructure and Green Belt;
- noise and vibration. The NPS for electricity networks notes that noise from overhead lines is unlikely to lead the IPC to refuse an application (scoped out at this stage, see Chapter 5);
- socio-economic impacts;
- traffic and transport impacts (scoped out at this stage, see Chapter 5);
- waste management (scoped out at this stage, see Chapter 5);
- water quality and resources (scoped out at this stage, see Chapter 5).

4.15 In addition, the NPS for electricity networks notes that with regard to electric and magnetic fields (EMF), the IPC will need to satisfy itself that ICNIRP guidelines are met [scoped out at this stage].

National Grid policies and industry guidelines

4.16 National Grid has its own policies and guidance which are applied in developing its infrastructure projects. The Stakeholder, Community and Amenity policy

incorporates its Schedule 9 statement[24]. The Holford and Horlock Rules, covering the siting of overhead lines and substations respectively, are regarded as industry standards and have been tested in public inquiry situations. For this reason, these documents are an important consideration in corridor selection. They are addressed in Chapters 8 and 10 of this report.

Conclusions

4.17 For the reasons set out above, it is appropriate to assess the relative merits of the alternative corridors taking the following factors into account :

- National Grid's statutory duties (Chapter 6);
- compliance with planning policies (Chapter 7);
- compliance with National Grid policies (Chapter 8);
- consultation representations (Chapter 9);
- landscape and visual impacts (Chapter 10);
- effects on the historic environment (Chapter 11);
- effects on biodiversity and geological conservation (Chapter 12);
- effects on land use and socio-economic factors (Chapter 13);
- engineering - deliverability (Chapter 14);
- effects on civil and military aviation and defence interests (Chapter 15);
- effects on flood risk and climate change resilience (Chapter 16).

4.18 These and other factors, including those which have been considered to be of little relevance in distinguishing between corridors, may be relevant for the environmental impact assessment of the detailed connection design within the preferred corridor. These will be established as part of a scoping exercise to be undertaken in consultation with the IPC (or its successor) and statutory bodies.

[24] This statement sets out how National Grid will meet the duty placed on it by s38 and schedule 9 of the Electricity Act 1989, which relates to the preservation of amenity

5 OTHER FACTORS CONSIDERED IN THE EVALUATION OF ROUTE CORRIDORS

Introduction

5.1 A wide range of factors was considered in preparing for the evaluation of corridor options. Some of these appear in the generic list of issues included in the overarching NPS for energy before Parliament for approval, while others were put forward by respondents to the Stage 1 Consultation or by the project team. Those factors which were scoped out of the evaluation, because they could not assist in comparing the merits of different corridors, are discussed in the following paragraphs.

Air Quality and Emissions

5.2 Although air quality and emissions is a generic impact included in the overarching NPS for energy, it would not be a material consideration in selecting a preferred corridor because the only effect which the scheme would have on air quality would be temporary, related to construction traffic. It is not possible to quantify such effects at this stage. However, experience suggests that there would be no significant difference between the corridors in terms of effects on air quality and emissions arising from the construction works.

Coastal Change

5.3 This generic impact, included in the overarching NPS for energy, would not be a material consideration in selecting a preferred corridor because none of the corridors has the potential to affect, or be affected by, coastal processes.

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

5.4 This generic impact, included in the overarching NPS for energy, would not be a material consideration in selecting a preferred corridor because the scheme would only have the potential to affect dust, odour and artificial light and, even then, such effects would be temporary, related to the construction phase. It is not possible to quantify such effects at this stage, however experience suggests that there would be no significant difference between the corridors with regard to these effects.

Noise and Vibration

5.5 This generic impact, included in the overarching NPS for energy, would not be a material consideration in selecting a preferred corridor because the effect of operational noise can only be assessed once detailed alignments are identified at the planning stage. The NPS for electricity networks notes that noise from overhead lines is unlikely to lead the IPC to refuse an application as a variety of mitigation measures are possible, such as the positioning of lines and the design and maintenance of conductors. It can be assumed that these measures can be applied equally to a connection in any of the corridors.

Traffic and Transport Impacts

5.6 This generic impact, included in the overarching NPS for energy, would not be a material consideration in selecting a preferred corridor because the only impact which the scheme would have on traffic and transport would be temporary, related to construction traffic and other construction activities. While it is not possible to quantify such impacts at this stage, there is no reason to suppose that the traffic and transport impacts of developing one corridor would be any worse than those associated with another corridor. There would be little to distinguish between the corridors using this criterion.

Waste Management

5.7 This generic impact, included in the overarching NPS for energy, would not be a material consideration in selecting a preferred corridor because waste would only arise in very small quantities from construction operations and would not be distinctly different for a connection in any of the corridors.

Water Quality and Resources

5.8 This generic impact, included in the overarching NPS for energy, would not be a material consideration in selecting a preferred corridor because the scope for affecting water quality would be limited and restricted to temporary effects during the construction phase and would be similar for a connection in any of the corridors.

Electric and Magnetic Fields

5.9 Representations to Stage 1 Consultation from members of the public expressed concern about the potential impact of electric and magnetic fields on a range of health issues. In addition, this is an impact which the NPS for electricity networks before Parliament for approval proposes should be evaluated. However, this would not be a material consideration in selecting a preferred corridor because National Grid designs all of its system to be compliant with ICNIRP guidelines[25] on exposure to electric and magnetic fields. The detailed connection design will take these guidelines fully into account, whichever corridor is selected. An assessment of the potential impact of electric and magnetic fields will be included in the environmental impact assessment of the preferred connection design.

5.10 The NPS for electricity networks notes only that the IPC will need to satisfy itself that ICNIRP guidelines are met.

Land Ownership

5.11 In general, land ownership would not affect corridor selection. This is because access to land and easements will be sought at the detailed connection design stage and there is no reason to suppose that agreements would be easier to reach on one corridor than another. In any event, land ownership issues would not prevent National Grid pursuing an otherwise optimal corridor.

Effect on Residential Amenity

5.12 A large number of individual respondents were concerned about the proximity of an overhead line to residential properties. The corridors were defined, in part, by reference to Supplementary Note A to the Holford Rules which states that overhead line routes should avoid passing close to residential areas on the grounds of general amenity. The identification of corridors therefore sought to avoid as far as possible the main built-up areas and areas where there are groups of residential properties with only small gaps between them. In some

[25] International Commission on Non-Ionising Radiation Protection : Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields : 1998

cases, proximity to properties is unavoidable. Chapter 10 provides a further evaluation of the corridors in terms of compliance with the Holford Rules.

5.13 It is accepted that effects on residential amenity can take various forms, including visual effects, noise and construction disturbance. All these types of impact were mentioned in representations to the Stage 1 Consultation. These are considered in the Stage 1 Feedback Report and in Chapter 9 of this report. The degree to which these effects are experienced by individual properties will be heavily influenced by the detailed design of the connection, in particular pylon positions which it is not possible to determine at the present stage in the development process. Environmental impact assessments, undertaken as the detailed connection design is developed, will address such issues in detail.

House Prices and Land Values

5.14 The impact on house prices and land values, both in general terms and in respect of specific properties, has not been adopted as a factor in corridor selection. This is because any potential impact is difficult to quantify and will vary from one case to another depending on a number of factors including the local property market, the nature of the property, its orientation and setting relative to the overhead line and the distance between the overhead line and the property. Land ownership and liability for compensation payments, in line with statutory provisions, will be addressed through discussions with individual landowners once a detailed connection design has been developed. As noted above, the approach to overhead line routeing seeks to maximise distance from residential properties and it will usually be possible to identify route alignments which avoid specific uses within the more broadly defined corridors.

Different Pylon Designs

5.15 Different pylon designs would apply equally to an overhead line in any corridor. They do not assist in distinguishing between corridors and their applicability and adoption will be considered at the detailed connection design stage.

6 ELECTRICITY ACT - SECTION 9 OBLIGATIONS

Introduction

6.1 As noted previously, Section 9 of the Electricity Act 1989 places an obligation on National Grid to develop and maintain "*an efficient, co-ordinated and economical*" system of electricity transmission.

6.2 In order to meet this statutory obligation, National Grid seeks to make the most efficient use of its existing infrastructure by measures such as managing power flows and investing in upgrading existing connections and substations, before considering investment in new connections. It then considers the implications for efficiency, co-ordination and cost effectiveness in evaluating a range of options in its strategic decision making. Cost comparison is a tool commonly used as a proxy in such situations. The lowest cost solutions are not always adopted, as other considerations, such as environmental effects, may favour alternative solutions - a balance needs to be struck.

6.3 Compliance with statutory duties relating to preservation of amenity (s38 Electricity Act) are of no less importance and are considered elsewhere in this report.

6.4 All of the corridors could accommodate a scheme which would be system compliant and efficient both in terms of individual scheme performance and the operation of the wider electricity transmission network (taking National Grid and UKPN operations into account). All would be deliverable within the timescale dictated by the connection agreements. Effective co-ordination can be achieved with the generators seeking connections and with UKPN.

Capital cost assumptions

6.5 Estimating the capital cost of the corridor options has taken the following assumptions into account :

- cost estimates based on generalised unit costs for the key elements of each option, reflecting recent contract values, but excluding the cost of

land purchase or easements which will be subject to discussions with landowners at a later stage in the development process;

- cost estimates based on an overhead line route aligned approximately on the centre line of each corridor. Some cost variation should therefore be anticipated depending on the eventual connection design adopted;
- overhead line costs inclusive of pylon construction (materials, foundations and steel erection), conductors, associated equipment, and provisional sums for access and scaffolding;
- Corridor 2 requires, in addition to the above, provision of a 2 SGT 400kV/132kV substation west of Twinstead Tee to act as a grid supply point for UKPN. Inclusive of the substation itself, terminal tower, downleads and associated equipment, the estimated cost is about £30m;
- Corridor 2 costs include for the dismantling of the existing 132kV overhead line between Burstall Bridge and Twinstead Tee. The existing cable connection between Burstall Bridge and Bramford substation, which would also become redundant, would be retained in situ.

6.6 The necessary system reinforcement will require the following common provision in terms of substations and other system upgrade works in addition to the provision of a Bramford to Twinstead Tee connection. The capital cost of these common works is estimated at £407.7m. These works will not form part of the development consent application to the IPC :

- new 400kV substation at Sizewell;
- replacement 400kV substation at Bramford;
- installation of switchable reactors at Rayleigh; and
- reconductoring works (Pelham – Twinstead Tee, Bramford – Rayleigh, Rayleigh – Coryton, 2 x Sizewell – Bramford).

Capital cost estimates

6.7 Based on the level of information available at this stage, the relative capital costs of the corridor options (assuming an overhead connection and additional system enhancements) are shown in Table 6.1. These costs include the costs of reconfiguration at Twinstead Tee. Corridor 2A and 2B costs are inclusive of a

substation west of Twinstead Tee. Cost estimates will be refined in the course of project development.

Table 6.1 - Capital costs of corridors

Corridor	Corridor length (km)	Estimated connection cost (£m)
1	26	46.8
2A	28.5	81.7
2B	27	79.0
3	26.5	47.7
4	30	54.0

6.8 Until such time as the scheme has been designed in detail and the involvement of contractors, suppliers and landowners sought, it is not possible to provide more detailed scheme costs.

Lifetime Costs

6.9 National Grid has determined, over many years of experience, that the use of "capital cost", which comprises cost of equipment and installation costs, is a reliable basis on which to make investment decisions. Experience shows that there is not a sufficient difference in operation, maintenance, decommissioning and disposal costs between technology options to alter materially a decision based on capital costs alone. However, in response to representations made to Stage 1 Consultation and other consultations on major projects, National Grid has undertaken a review of lifetime costs and will now take these into account in investment decisions.

6.10 The calculation of lifetime costs takes into account :

- the capital cost of the equipment delivered, installed and commissioned;
- the net present value of the cost of transmission losses over the life time (40 years) of the assets;
- the net present value of the typical cost of operation and maintenance over the life time (40 years) of the assets;

- a discount rate of 3.5% as recommended in the Treasury Green Book[26].

6.11 It is unusual for a part of the transmission system to be decommissioned and the site reinstated. Typically, transmission assets will be decommissioned and removed only as part of an upgrade or replacement by different assets. Hence, decommissioning and reinstatement costs are not included in the lifetime costs.

6.12 Based on the level of information available at this stage, the relative lifetime costs associated with an overhead line between Bramford and Twinstead Tee for each corridor option are shown in Table 6.2.

Table 6.2 : Estimated cost of corridor options[27]

Item	Estimated cost £m				
	Corridor 1	Corridor 2A	Corridor 2B	Corridor 3	Corridor 4
Capital cost	46.8	81.7	79.0	47.7	54.0
Lifetime cost	117.8	159.6	152.8	120.1	136.0

6.13 National Grid's approach and individual project proposals are subject to regular scrutiny and review by the energy regulator Ofgem. Ofgem employs independent technical consultants to undertake a robust formal review of the project details, and the overarching business processes and policies adopted by National Grid. Detailed reports are made to Ofgem and these are publicly available.

Cost Benefit Analysis

6.14 Some representations received to Stage 1 Consultation queried whether a cost benefit analysis had been undertaken. Cost benefit analysis (CBA) is defined on page 4 of HM Treasury's Green Book as "*analysis which quantifies in monetary terms as many of the costs and benefits of a proposal as feasible, including items for which the market does not provide a satisfactory measure of economic value*."

[26] HM Treasury : The Green Book - appraisal and evaluation in central government : undated
[27] excludes costs associated with other system enhancement elements which are common to all corridor options

6.15 National Grid does not consider that effects on the environment from its proposals can be properly given a monetary value. Decisions on the balance to be struck between National Grid's statutory and licence duties are matters of judgement for itself and ultimately the IPC and/or Secretary of State in determining whether development consent should be granted for any proposal that is brought forward. This is consistent with other planning judgements that are made in determining applications for planning permission or consents under other legislation. The effects on the environment from the proposed development will be assessed in accordance with the relevant Environmental Impact Assessment Regulations and associated Guidance.

6.16 Issues of the willingness of the public to pay to avoid the effects of transmission lines are matters for the Secretary of State and Ofgem. These are matters that are currently being considered and have been the subject of consultation by Ofgem. National Grid will review its decision-making process in the light of any advice from the Secretary of State or Ofgem on the matter of willingness to pay.

6.17 National Grid has recently commenced a high level survey to assess the public's attitude towards "willingness to pay" and the increases in their electricity bills that they would be prepared to pay to put new and/or existing electricity transmission lines underground. The results of this survey will inform National Grid's submission to Ofgem in July 2011. If appropriate, National Grid will carry out a more detailed assessment of the public's willingness to pay following this RIIO submission.

Stage 1 Consultation Representations

6.18 During the Stage 1 Consultation, a common query raised by respondents was the cost of undergrounding and how this compared to the cost of constructing an overhead connection.

6.19 As noted earlier in this section of the report, the costs of undergrounding are significantly higher than those associated with constructing an overhead line. A major element of this cost differential is accounted for by the cable itself. The underground conductor has to be bigger than its overhead counterpart to reduce its electrical resistance and hence the heat produced. The requirement to properly insulate whilst at the same time maintaining the cable's rating (its ability to transmit the required current) means that special insulation is needed.

This results in a large conductor, using expensive materials and manufacturing techniques. At either end of the underground section, terminal tower pylons and cable sealing end compounds are required which are substantial structures.

6.20 There are also substantial costs associated with burying the cables in the ground, both in terms of construction and subsequent maintenance costs. When cable circuit faults develop, it can be a long and expensive task to locate a fault, excavate the cable and undertake the necessary repairs. Apart from the cost of the repair itself, there is an additional operational cost relating to the period of time for which a circuit is out of service.

6.21 The costs of underground cable systems can vary widely even for the same voltage, depending on the amount of electrical power they can carry (rating), the number of cables required to meet the rating, and their length, making it difficult to generalise about costs. The IPC has suggested that an independent authoritative report on costs of underground and subsea transmission would be useful. KEMA, with IET (Institution of Engineering and Technology) acting in a quality assurance role, were commissioned to do this work, assessing the alternative and comparative costs of placing high voltage electricity lines underground or in the seabed including, cable prices, costs of the different civil engineering methods which could be used, and the costs of any necessary infrastructure required to support underground or undersea cables. In June 2011, the IET announced that insufficient data had been submitted to enable this authoritative report to be completed. Arrangements are being put in place for further stages of the work to be taken forward. It is expected that a final analysis will be published later this year. When the study is available National Grid will look very carefully at the final analysis and review its conclusions in light of any new findings.

6.22 Recognising that local factors, such as geology and physical features, can play a part in influencing installation costs, a major cable supplier was commissioned to provide budget cost estimates for undergrounding an indicative 2.4km section of line on Corridor 2 (this being the approximate length of corridor within the Dedham Vale AONB - between Polstead and Leavenheath). This was carried out purely for costing purposes and was not based on any detailed assessment of the suitability of a particular section of route for undergrounding nor yet of any acceptance of the principle of undergrounding through the AONB.

6.23 The capital cost of undergrounding a 2.4km section of line was estimated at £52.75m. This included for the design, supply, installation and testing of two three-phase cable circuits using XLPE cable in 800m section lengths, together with sealing end compounds at each end of the underground section. By comparison, a similar length of overhead line would cost approximately £4m.

6.24 Some representations to the Stage 1 Consultation advocated that the whole of the route between Bramford and Twinstead Tee should be installed underground. Assuming the shortest route possible (likely to be between 26km and 28km, capital costs for the AC underground cables alone (not including reactive compensation)would range from £572m-£616m. More detail on underground alternatives including GIL is included in the Review of Strategic Options Report 2011.

6.25 To install cables in tunnels would involve the significant civil engineering works associated with driving twin tunnels of at least 4m diameter for a distance of about 26km. Twin tunnels would be required to dissipate the heat generated by the cables. Approximately ten access shafts would be required, each of which would be surmounted by a headhouse to provide access and ventilation. The anticipated scheme development period of about seven years means that National Grid would be unable to meet its contractual obligations. There would also be significant environmental impacts associated with the excavation and removal of large quantities of spoil material.

6.26 A number of representations received sought further information on the relative costs of the corridor options, which is recorded earlier in this Chapter. Some were concerned that National Grid would adopt the cheapest solution, while others expressed the view that they would be willing to pay more (in terms of their own electricity bills) if this secured an underground solution which would avoid the environmental effects associated with an overhead line.

Conclusions

6.27 If capital cost, or lifetime cost, alone were considered, Corridor 1 as an overhead line would be the preferred solution. However National Grid must balance cost against other factors, including impact on amenity.

7 NATIONAL AND LOCAL POLICY CONTEXT

Introduction

7.1 The decision makers must give due consideration to the context provided by national and local policies, which are reviewed in this chapter of the report.

Context

Energy and Climate Change Policy

7.2 The 2007 White Paper[28]: "Meeting the Energy Challenge" sets out the Government's international and domestic energy strategy to address the two main long term energy challenges faced by the UK :

- tackling climate change by reducing carbon dioxide emissions both within the UK and abroad; and
- ensuring secure, clean and affordable energy as the UK becomes increasingly dependent on imported fuel.

7.3 The strategy is based around the need to :

- save energy;
- develop cleaner energy supplies; and
- secure reliable energy supplies at prices set in competitive markets.

7.4 It is based on the principle that independently regulated, competitive energy markets, are the most cost-effective and efficient way of delivering the Government's objectives.

7.5 Section 5.2 of the White Paper states that "*a secure and reliable electricity system requires timely investment in the power stations used to generate electricity. We also need investment in transmission and distribution networks to transport the electricity from the point of generation to the point of use*."

[28] HM Government : Meeting the Energy Challenge - A White Paper on Energy : May 2007

7.6 Paragraph 5.2.9 notes that "*much of the new transmission investment is driven by the needs of the generation companies that use (or plan in the future to use) the network. The plans for additional investment in the transmission system recognise that there is a large volume of primarily wind electricity generation that will connect to the transmission system over the coming years. However, the exact volume and timing are uncertain and, as a result, connection of these renewable generation stations presents new challenges*."

7.7 The Climate Change Act 2008[29] has two main aims :

- to improve carbon management, helping the transition towards a low-carbon economy in the UK;
- to demonstrate UK leadership internationally, signalling that the UK is committed to taking its share of responsibility for reducing global emissions.

7.8 Among its main measures are :

- a legally binding target of at least an 80 percent cut in greenhouse gas emissions by 2050, to be achieved through action in the UK and abroad. Also a reduction in emissions of at least 34 percent by 2020. Both these targets are against a 1990 baseline;
- a carbon budgeting system which caps emissions over five-year periods, with three budgets set at a time, to help the UK meet its 2050 target.

7.9 Stemming from the Climate Change Act, the UK Low Carbon Transition Plan[30] details the actions to be taken to cut carbon emissions by 34% by 2020, based on 1990 levels. It sets out proposals for transforming the power sector, homes and workplaces, transport, farming and the management of land and waste, to meet these carbon budgets, secure energy supplies, maximise economic opportunities and protect the most vulnerable.

7.10 To deliver these goals the Government pledged to secure energy supplies by ensuring a supportive climate for the substantial new investment needed to bring forward low carbon infrastructure. It also endorsed industry plans to

[29] Climate Change Act 2008 : 2008 c27
[30] HM Government : The UK Low Carbon Transition Plan - National Strategy for Climate and Energy : July 2009

increase grid capacity and to speed up connection of renewable electricity to the grid and the development of new technologies which could enable the grid to work better in the future.

Planning Policy Statements

7.11 Planning Policy Guidance notes (PPGs) and their replacements Planning Policy Statements (PPSs) are prepared by the government after public consultation to explain statutory provisions and provide guidance to local authorities and others on planning policy and the operation of the planning system. They are material considerations in determining applications for development. In considering these documents, the emphasis is on identifying those sections which may influence corridor selection and/or indicate the weight which should be placed on certain factors used to guide the selection.

7.12 **Planning Policy Statement 1: Delivering Sustainable Development**[31] states that "*the Government is committed to protecting and enhancing the quality of the natural and historic environment, in both rural and urban areas. Planning policies should seek to protect and enhance the quality, character and amenity value of the countryside and urban areas as a whole. A high level of protection should be given to most valued townscapes and landscapes, wildlife habitats and natural resources. Those with national and international designations should receive the highest level of protection*."

7.13 **Planning and Climate Change: Supplement to Planning Policy Statement 1**[32] states that tackling climate change is a key Government priority for the planning system and sets out how planning should contribute to reducing emissions and stabilising climate change and take into account its unavoidable consequences. It notes that planning authorities should adopt policies which are designed to promote and not restrict renewable and low-carbon energy and supporting infrastructure. In particular, it states that "*planning authorities should not require applicants for energy development to demonstrate either the overall need for renewable energy and its distribution, nor question the energy*

[31] Planning Policy Statement 1: Delivering Sustainable Development : Office of the Deputy Prime Minister : January 2005
[32] Planning and Climate Change: Supplement to Planning Policy Statement 1 : Department for Communities and Local Government : December 2007

justification for why a proposal for such development must be sited in a particular location."

7.14 **Planning Policy Statement 5: Planning for the Historic Environment**[33] states that "*there should be a presumption in favour of the conservation of designated heritage assets and the more significant the designated heritage asset, the greater the presumption in favour of its conservation should be..... Substantial harm to or loss of a grade II listed building, park or garden should be exceptional. Substantial harm to or loss of designated heritage assets of the highest significance, including scheduled monuments, protected wreck sites, battlefields, grade I and II* listed buildings and grade I and II* registered parks and gardens, World Heritage Sites, should be wholly exceptional*." It goes on to state that where developments might adversely affect the setting of a heritage asset, local planning authorities should weigh any such harm against the wider benefits of the application. The greater the negative impact on the significance of the heritage asset, the greater the benefits that will be needed to justify approval.

7.15 **Planning Policy Statement 7: Sustainable Development in Rural Areas**[34] states that planning authorities should continue to ensure that the quality and character of the wider countryside is protected and, where possible, enhanced. They should have particular regard to any areas that have been statutorily designated for their landscape, wildlife or historic qualities where greater priority should be given to restraint of potentially damaging development.

7.16 PPS7 notes that nationally designated areas, including Areas of Outstanding Natural Beauty (AONB), have been confirmed by the Government as having the highest status of protection in relation to landscape and scenic beauty. The conservation of the natural beauty of the landscape and countryside should therefore be given great weight in planning policies and development control decisions in these areas. The conservation of wildlife and cultural heritage are important considerations in all these areas. It goes on to state that "*major developments should not take place in these designated areas, except in*

[33] Planning Policy Statement 5: Planning for the Historic Environment : Department for Communities and Local Government : March 2010
[34] Planning Policy Statement 7: Sustainable Development in Rural Areas : Office of the Deputy Prime Minister : August 2004

exceptional circumstances. This policy includes major development proposals that raise issues of national significance. Because of the serious impact that major developments may have on these areas of natural beauty, and taking account of the recreational opportunities that they provide, applications for all such developments should be subject to the most rigorous examination. Major development proposals should be demonstrated to be in the public interest before being allowed to proceed."

7.17 In considering applications for major development in nationally designated areas, PPS7 requires rigorous examination of:

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

7.18 The Government recognises and accepts that there are areas of landscape outside nationally designated areas that are particularly highly valued locally, but considers that criteria-based policies in LDDs should provide sufficient protection for these areas.

7.19 PPS7 states that the presence of best and most versatile agricultural land (defined as land in grades 1, 2 and 3a of the Agricultural Land Classification), should be taken into account alongside other sustainability considerations. Little weight in agricultural terms should be given to the loss of agricultural land in grades 3b, 4 and 5.

7.20 PPS7 recognises that tourism and leisure activities are "*vital to many rural economies. As well as sustaining many rural businesses, these industries are a significant source of employment and help to support the prosperity of country towns and villages, and sustain historic country houses, local heritage and culture*."

7.21 **Planning Policy Statement 9: Biodiversity and Geological Conservation**[35] makes it clear that nationally and internationally designated sites should be given a high degree of protection under the planning system. Proposals affecting sites of regional and local biodiversity and geological interest, should be judged against criteria-based policies in local development documents Ancient woodland should be protected unless the need for, and benefits of, the development in that location outweigh the loss of the woodland habitat. Through policies in plans, local authorities should also conserve other important natural habitat types that have been identified in the Countryside and Rights of Way Act 2000[36] section 74 list, as being of principal importance for the conservation of biodiversity in England. The maintenance of networks of natural habitats is also promoted by PPS9.

7.22 **Planning Policy Statement 22 Renewable Energy**[37] promotes renewable energy projects in line with the Government's wider energy policy, but does not give guidance on the development of the electricity transmission infrastructure which will be required to support it - as is the case with the Bramford to Twinstead Tee Connection Project. In line with other Planning Policy Statements, it reiterates the need to protect nationally and internationally designated sites.

7.23 **Planning Policy Guidance Note 24 Planning and Noise**[38] states that the impact of noise can be a material consideration in the determination of planning applications. It recognises that much of the development which is necessary for the creation of jobs and the construction and improvement of essential infrastructure will generate noise. It states that, while local planning authorities must ensure that development does not cause an unacceptable degree of disturbance, the planning system should not place unjustifiable obstacles in the way of such development.

7.24 PPG24 notes that a number of measures can be introduced to control the source of, or limit exposure to, noise, including maintaining a degree of separation between the noise source and noise-sensitive properties. Special

[35] Planning Policy Statement 9: Biodiversity and Geological Conservation : Office of the Deputy Prime Minister : August 2005
[36] Countryside and Rights of Way Act 2000 c37
[37] Planning Policy Statement 22 Renewable Energy : Office of the Deputy Prime Minister : August 2004
[38] Planning Policy Guidance Note 24 Planning and Noise : Office of the Deputy Prime Minister : September 1994

consideration is required where noisy development is proposed in or near Sites of Special Scientific Interest (SSSIs) and for development which would affect the quiet enjoyment of designated areas, including Areas of Outstanding Natural Beauty.

7.25 **Planning Policy Statement 25 Development and Flood Risk**[39] states that all forms of flooding and their impact on the natural and built environment are material planning considerations. The aims of planning policy on development and flood risk are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall. PPS25 applies a sequential test such that new development should be directed to sites at the lowest probability of flooding from all sources. It recognises that grid substations may need to be located in flood risk areas for operational reasons, in which case they should be designed and constructed to remain operational and safe for users in times of flood.

Regional planning policies

7.26 Regional planning policies are contained in the **East of England Plan**[40]. The Coalition Government has announced its intention to revoke Regional Spatial Strategies, as provided for in clause 89 of the Localism Bill.

7.27 Policy ENG2 in the East of England Plan supports the development of new facilities for renewable power generation, but makes no specific reference to electricity transmission.

7.28 Policy ENV2 states that the highest level of protection should be afforded to the East of England's nationally designated landscapes, including Dedham Vale AONB. Within the AONBs priority over other considerations should be given to conserving the natural beauty, wildlife and cultural heritage of each area.

[39] Planning Policy Statement 25 Development and Flood Risk : Department for Communities and Local Government : March 2010
[40] East of England Plan The revision to the Regional Spatial Strategy for the East of England : Government Office for the East of England : May 2008

Similarly Policy ENV3 seeks to ensure that sites internationally and nationally designated for biodiversity are given the strongest level of protection, with proper consideration given to the potential effects of development on the conservation of habitats and species outside designated sites, and on species protected by law.

7.29 Other elements of regional planning policy include :

- ensuring new development minimises damage to biodiversity and earth heritage resources by avoiding harm to local wildlife sites;
- safeguarding, conserving, and restoring regionally important geological and/or geomorphological sites;
- a strong presumption against development that would result in the loss or deterioration of ancient semi-natural woodland and other woodlands of acknowledged national or regional importance;
- the highest level of protection to historic and archaeological areas, sites and monuments of international, national and regional importance, including safeguarding the landscape context and setting of buildings and settlements relating to historic assets.

Development Plan

7.30 The Suffolk Structure Plan ceased to form part of the Development Plan for Suffolk in September 2007, with the exception of eleven policies saved by a direction from the Secretary of State[41]. The only one of these which could potentially have a bearing on the current proposal is policy MP4 which seeks to protect permitted mineral reserves and potential resources as far as is reasonably practicable from development which might preclude their later extraction.

7.31 Similarly most of the policies in the Essex and Southend-on-Sea Structure Plan[42] expired in September 2007, one relevant exception being policy MIN4 which states that potentially workable mineral deposits will be safeguarded from surface development that would sterilise the minerals or prejudice their working.

[41] Government Office for East of England : Direction under Paragraph 1(3) Of Schedule 8 to the Planning and Compulsory Purchase Act 2004 Policies Contained In Suffolk Structure Plan 2001: September 2007
[42] Essex County Council : Essex and Southend on Sea Structure Plan : 2001

The policy does allow for the prior extraction of minerals where the surface development would otherwise be acceptable.

7.32 The majority of the area covered by the four corridors lies within Babergh District.

7.33 The Babergh Local Plan Alteration No 2[43] was adopted in June 2006. The plan includes a number of policies which aim to protect the environment of the district, from developments which would have a material adverse impact on :

- nationally and internationally designated nature conservation sites;
- existing or proposed County Wildlife Sites, Regionally Important Geological/Geomorphological Sites or Local Nature Reserves;
- protected species;
- existing semi-natural features, including rivers, streams, ponds, marshes, woodlands, hedgerows, trees, features of geological interest, wildlife corridors and green wedges;
- listed buildings and their settings;
- conservation areas;
- character, appearance or setting of historic parks and gardens;
- landscape quality and the character of the countryside.

7.34 In functional floodplains the grant of planning permission for built development will be wholly exceptional and limited to essential infrastructure.

7.35 Policy CR02 states that "*the landscape of the Dedham Vale and the Suffolk Coast and Heaths Areas of Outstanding Natural Beauty will be safeguarded through the strict control of development. Unless there is an overriding national need for development having a significant impact in the particular location and no alternative site is available, such developments will not be allowed. Due regard will be given to the provisions contained within the Dedham Vale and Stour Valley, and the Suffolk Coast and Heaths Management Strategies*."

[43] Babergh Local Plan Alteration No 2 : Babergh District Council : June 2006

7.36 Related to this policy, paragraph 6.19 states "*the provision of public utility services may necessitate the construction of buildings and other installations, often of a large scale such as grid lines and water towers. If it is necessary to site these in Areas of Outstanding Natural Beauty, care should be taken to minimise their impact*." However Policy CR03 states that "*in considering proposals by statutory undertakers and utility providers for buildings and installations in Areas of Outstanding Natural Beauty, particular attention will be paid to siting, design and landscaping. Major utilities and overhead power lines will be discouraged in Areas of Outstanding Natural Beauty*".

7.37 The Local Plan designates several areas as Special Landscape Areas. Although Policy CR05 does not rule out overhead lines in Special Landscape Areas, it states that "*major utilities and power lines will be permitted only where it can be demonstrated that they do not have a significant detrimental effect on the landscape characteristics of the Special Landscape Area*".

7.38 Babergh District Council has commenced production of its Local Development Framework but does not yet have a Core Strategy in place.

7.39 The eastern end of the corridors, in the vicinity of Bramford substation and Flowton, lies within Mid Suffolk District.

7.40 Mid Suffolk District Council adopted its Core Strategy[44] in 2008. This sets the framework for more detailed development control policies. Policy CS5 refers to maintaining and enhancing the environment. Until such time as new Development Plan Documents are approved, some of the policies in the Local Plan[45] remain relevant. These include those protecting :

- listed buildings and their settings;
- gardens and parkland of historic interest;
- the character and appearance of conservation areas;
- ancient monuments and their settings;
- woodland, particularly ancient woodland;

[44] Core Strategy Development Plan Document : Mid Suffolk District Council : September 2008.
[45] Mid Suffolk Local Plan : Mid Suffolk District Council : September 1998

- designated wildlife areas, including County Wildlife Sites and Local Nature Reserves;
- landscape quality and the character of the countryside.

7.41 Policy CL3 states that "*new major installations for utilities and power lines exceeding 33kv should be carefully sited to ensure minimal intrusion in the landscape. the feasibility of undergrounding electricity lines will be regarded as a material consideration*." The supporting text notes that "*wherever possible the District Planning Authority expects major utility installations, particularly power lines, to be located away from Special Landscape Areas because of their visual intrusion. Any proposals put forward by the utility companies e.g. gas, water and electricity suppliers, will need to demonstrate that more environmentally acceptable sites, routes or systems are not available. The feasibility of undergrounding power lines should be assessed taking a balanced view of the archaeological and ecological impact of undergrounding*".

7.42 A small part of the corridors, to the west of the River Stour, lies within Braintree District. The Local Plan[46] was adopted in 2005 and seeks to protect :

- landscape quality and the character of the countryside;
- Special Landscape Areas from inappropriate development;
- Sites of Special Scientific Interest;
- Local Nature Reserves, Wildlife Sites and Regionally Important Geological/Geomorphological Sites;
- Protected Species;
- the open character, nature conservation importance or recreational importance of the floodplains of certain rivers including the River Stour;
- the character and appearance of designated Conservation Areas and their settings;
- Parks and Gardens of Special Historic Interest;
- Scheduled Ancient Monuments and other nationally important archaeological remains, and their settings.

[46] Braintree District Council : Braintree District Local Plan Review: July 2005

7.43 In respect of overhead lines, the Plan comments that the Council "*will seek alterations to siting and design where proposals affect the character or setting of particular planning interests, such as Conservation Areas, sites of archaeological or nature conservation interest*."

7.44 Braintree District Council published a draft of its submission Core Strategy[47] in May 2010 for consultation. This includes aims "*to protect, restore and enhance the natural habitats, biodiversity and landscape character of the countryside and the open spaces and green corridors within towns and villages and improve ecological connectivity across the District*" and "*to preserve and enhance the historic character and locally distinctive identity of the District, to ensure that new development provides high quality, environmentally friendly design and to improve the public realm*."

AONB Management Plan

7.45 The Dedham Vale AONB and Stour Valley Management Plan 2010-2015[48] was prepared by the Dedham Vale AONB and Stour Valley Joint Advisory Committee. As required by Section 85 of the Countryside and Rights of Way Act 2000, the plan sets out policy for AONB local authorities relating to the management of the Dedham Vale AONB. The emphasis of the plan is on maintaining those features which contribute to the particular landscape, heritage and biodiversity of the area while retaining a working landscape and supporting those communities within the designated area. The plan has been consulted upon but is yet to be finalised.

National Policy Statements (before Parliament for approval)

7.46 The National Policy Statements, laid before Parliament for approval in June 2011, set out the most recent proposals for Government policy for the delivery of major energy infrastructure. Although not yet adopted, they should be material considerations.

[47] Braintree District Council : Submission Draft Core Strategy : May 2010
[48] Dedham Vale AONB and Stour Valley Management Plan 2010-2015 : Dedham Vale AONB and Stour Valley Joint Advisory Committee : January 2010

7.47 The **Overarching National Policy Statement for Energy (EN-1)** [49] is part of a suite of National Policy Statements (NPS) laid before Parliament for approval by the Secretary of State for Energy and Climate Change.

7.48 The overarching NPS for energy notes that it is critical that the UK continues to have secure and reliable supplies of electricity as we make the transition to a low carbon economy. This means ensuring that :

- there is sufficient capacity (including a greater proportion of low carbon generation) to meet demand at all times, including a safety margin of spare capacity to accommodate fluctuations in supply or demand;
- this capacity is reliable enough to meet demand as it arises;
- there is a diverse mix of technologies and fuels, (including primary fuels imported from a wide range of countries); and
- there are effective price signals, so that the market can react in a timely way to minimise imbalances between supply and demand.

7.49 The Government's objectives for energy and climate change will require further diversification of the UK's energy sources and much greater use of renewable and other low carbon forms of generation. It is estimated that there will be a need for about 59 GW net of new capacity by 2025, of which 33GW would need to come from renewable sources (mainly off-shore wind) to meet renewable energy commitments. The government considers that a significant proportion of new non-renewable capacity should be met by nuclear power. The NPS notes that "*construction of new lines of 132kV and above will be needed to meet the significant national need for expansion and reinforcement of the UK's transmission and distribution networks*". However it also notes that the costs and benefits of alternative technological approaches should be considered before any overhead line proposal is consented.

7.50 The NPS states that a 'smarter' electricity grid will be needed to support a more complex system of electricity supply and demand with generation occurring in a greater diversity of locations. It notes that "*new lines will have to be built, and the location of renewable energy sources and designated sites for new nuclear*

[49] Department for Energy and Climate Change : Overarching Energy National Policy Statement : Version for Approval : June 2011

power stations makes it inevitable that a significant proportion of those new lines will have to cross areas where there is little or no transmission infrastructure at present, or which it may be claimed should be protected from such intrusions".

7.51 The NPS notes that the Electricity Networks Strategy Group (ENSG) has identified areas for infrastructure enhancement and believes that this work[50] "*represents the best available overview of where the electricity networks will need to be reinforced and augmented in order to achieve the UK's renewable energy and security of supply targets, and will therefore be relevant to the IPC's consideration of electricity network proposals*".

7.52 The ENSG report identifies the need for a new double circuit overhead line between Bramford and Twinstead Tee. The NPS does not rule out additional schemes developed in response to other generation proposals.

7.53 The government is confident that the need for new energy infrastructure has been established and that need should not be challenged further by the IPC.

7.54 The NPS sets out how the IPC should frame its consideration of alternatives. In particular it notes that the IPC should be guided in considering alternative proposals by whether there is a realistic prospect of the alternative delivering the same infrastructure capacity (including energy security and climate change benefits) in the same timescale as the proposed development. It advises that the consideration of alternatives should be carried out in a proportionate manner.

7.55 The NPS also discusses how projects should be assessed and the potential for mitigating adverse effects.

7.56 The **National Policy Statement for Electricity Networks Infrastructure (EN-5)**[51], before Parliament for approval, highlights that the new electricity generating infrastructure that the UK needs to move to a low carbon economy, while maintaining security of supply, will be heavily dependent on the

[50] Electricity Networks Strategy Group : Our Electricity Transmission Network : A Vision for 2020 : March 2009
[51] Department for Energy and Climate Change : National Policy Statement for Electricity Networks Infrastructure : Version for Approval : June 20110

availability of a fit for purpose and robust electricity network. That network will need to be able to support a more complex system of supply and demand and cope with generation occurring in locations of greater diversity. It indicates that the IPC should start its assessment of applications for infrastructure covered by the NPS on the basis that need has been demonstrated.

7.57 The NPS does not seek to direct applicants to particular sites or routes for electricity networks infrastructure. It notes that the general location of electricity network projects is often determined by the location, or anticipated location, of a particular generating station in relation to the existing network. In other cases the requirement for a line may be the result of the need for more strategic reinforcement of the network. The NPS accepts that the most direct route for a new connection may not be the most appropriate given engineering and environmental considerations.

7.58 Part 2 of the NPS sets out the basis for assessing proposals. It advises for a variety of topic areas (including many of those normally covered in an Environmental Impact Assessment) : what the applicant's own assessment should address and what principles the IPC should adopt in its decision making. It also advises on the weight to be given to certain issues and on the treatment of mitigation measures, particularly how these may be enforced through conditions or obligations. Any assessment will also need to cover those issues raised in the Overarching NPS for Energy (EN-1).

7.59 The NPS notes that the IPC should expect applicants to demonstrate good design in respect of landscape and visual amenity and in the design of the project to mitigate impacts such as noise and electric and magnetic fields.

7.60 Resilience to climate change is highlighted as a main issue and the NPS advises that applicants should in particular set out how the proposal would be resilient to:

- flooding, particularly for sub-stations that are vital for the electricity transmission and distribution network;
- effects of wind and storms on overhead lines;
- higher average temperatures leading to increased transmission losses; and

- earth movement or subsidence caused by flooding and drought for underground cables.

7.61 Resilience to climate change is discussed in Chapter 16 of this report.

7.62 The NPS supports the continued application of the Holford Rules to guide the selection of routes for overhead lines. It states that the IPC should expect the applicant to have followed these Rules where possible in its overhead line proposals and that the IPC should take them into account in any consideration of alternatives and in considering the need for any additional mitigation measures.

7.63 In discussing the undergrounding of lines, the NPS states that "*where there are serious concerns about the potential landscape and visual effects of a proposed overhead line, the IPC will have to balance these against other relevant factors, including the need for the proposed infrastructure, the availability and cost of alternative sites and routes and methods of installation (including undergrounding)* ". It states that the IPC should only refuse consent for overhead line proposals in favour of an underground or subsea line if it is satisfied that the benefits of the non-overhead line alternative clearly outweigh any extra economic, social and environmental costs and that technical difficulties are surmountable. Undergrounding of a line solely to further reduce the level of EMF exposure is unlikely to be justified. The landscape implications of the corridors are discussed in Chapter 11 of this report.

7.64 In respect of noise from overhead lines, the NPS notes that this is unlikely to lead to the IPC refusing an application but it may need to consider the use of appropriate conditions to ensure noise is minimised as far as possible. It is therefore considered that noise would not influence corridor selection, but may influence the detailed connection design.

7.65 The NPS notes that the balance of scientific evidence over several decades of research has not proven a causal link between EMFs and cancer or any other disease. Furthermore, the Department of Health's Medicines and Healthcare Products Regulatory Agency does not consider that transmission line EMFs constitute a significant hazard to the operation of pacemakers. There is little evidence that exposure of crops, farm animals and natural ecosystems to transmission line EMFs would have any agriculturally significant consequences.

7.66 The NPS notes that the International Commission on Non-Ionising Radiation Protection (ICNIRP) has developed health protection guidelines[52] for both public and occupational exposure. Regulations governing the minimum height, position, insulation and protection specifications of conductors to ensure clearance of objects mean that power lines at or below 132kV will comply with the ICNIRP guidelines. Where applications for new 275kV and 400kV overhead lines or underground cables are involved, the IPC will need to be satisfied that the ICNIRP basic restrictions for public exposure will not be reached or exceeded for any residential accommodation along the route of the line. It is therefore considered that EMF would not influence corridor selection, but may influence the detailed connection design.

Stage 1 Consultation Representations

7.67 Although the representations from the local planning authorities did not refer to specific national or local policies, it may be inferred that their representations, and the recommendations regarding corridor preference, were made in the context of this policy background. Dedham Vale and Stour Valley AONB Partnership considered[53] that there was overwhelming national, regional and local policy advising against development in the protected landscape, and in the setting of the protected landscape of the AONB and cited PPS7 and a number of Local Plan policies. The Partnership contended that, for this reason, Corridors 1 and 2 should have been excluded from consideration from the outset. A number of the Parish Councils also considered that the proposed connection would breach planning policies and the matter was also raised by a few public respondents.

7.68 The decision taken on the preferred corridor will give appropriate weight to the national, regional and local planning policies relating to development in AONBs. It has always been recognised that the presence of an AONB would be an issue affecting route selection, as policies incorporate a presumption against development in such areas. However none of the policies rules out development in AONBs. The potential impact on the AONB of the different corridors is

[52] International Commission on Non-Ionising Radiation Protection : Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields : 1998
[53] Dedham Vale and Stour Valley AONB Partnership : Response to National Grid, Bramford – Twinstead 400kV Overhead Line Project : January 2010

considered further in Chapter 10. Given the existence of an overhead line corridor through the AONB it would not have been reasonable to exclude Corridors 1 and 2 from the consultation exercise and it is considered that National Grid would have been criticised had it done so.

Comparison of Impacts of Corridors

7.69 National energy policy is generally supportive of the connection proposal and national and regional planning policies and guidance form the context for, and lend weight to, local planning policies. An important consideration is the degree to which the route corridors would affect areas which are designated in national and local planning policies.

7.70 Dedham Vale AONB presents an important constraint in both national and local policy terms. Corridors 3 and 4 would have no direct effect on the AONB. In so far as the proposal is considered to comprise major development for this purpose, the extent to which the other corridors may be considered to be justified in terms of the national policy to conserve the natural beauty of the landscape and countryside is dependent on the tests set out in PPS7 (see paragraph 7.17 above) including:

- Whether the proposal is demonstrated to be in the public interest - see below;
- the need for the development - the overarching NPS for energy states that, in general terms, the need for new energy infrastructure has been established. In this particular case, the need for the development is set out in the Need Case, which clearly demonstrates that failure to implement the connection would have serious implications for national energy supply and distribution;
- the cost of, and scope for, alternatives outside the designated area - the Review of Strategic Options Report has considered a range of options and concluded that a Bramford to Twinstead Tee connection would be the most appropriate in terms of National Grid's statutory duties. Corridors 3 and 4 have been identified which pass outside the AONB and the merits of these, compared to Corridors 1 and 2 are assessed elsewhere in this report. Chapter 18 compares the merits of the route corridors and concludes that there are good reasons for not preferring Corridors 3 or 4;

- detrimental effects on the environment, the landscape and recreational opportunities - the effects of a transmission line in Corridors 1 and 2, which pass through the AONB, are considered in Chapters 10 to 13. These assessments conclude that while neither corridor would have significant effects on recreational opportunities, Corridor 1 would have a significant adverse effect on the landscape, which would be contrary to planning policy. Corridor 2 would not increase the number of pylons or overhead lines passing through the AONB. Whilst this would result in a change of scale that would be perceptible, if it was considered unacceptable, the effects could be mitigated;
- the scope for moderating detrimental effects - while it is not considered that the effects of Corridor 1 could be effectively mitigated, consideration has already been given to the potential for mitigating Corridor 2 by undergrounding, as described in Chapter 17. This is a matter which would be addressed further in the detailed connection design.

7.71 In terms of local policy considerations, all corridors affect areas locally designated as Special Landscape Areas, to a greater or lesser degree. Corridors 1, 2 and 3 would pass through between 13km and 15km of designated area, while Corridor 4 could, dependent on detailed connection design, affect between 6.5km and 11.5km. Corridors 3 and 4 pass through locally designated areas where there are currently no overhead lines.

7.72 As it involves the construction of an additional overhead line paralleling existing lines, Corridor 1 would therefore have the greatest impact on the AONB and Special Landscape Areas and would be least acceptable in policy terms. Of those corridors passing outside the AONB, Corridor 3 would be least acceptable in terms of effects on Special Landscape Areas.

7.73 Corridor 2 would not involve introducing an additional overhead line into either nationally or locally designated areas, and provides an opportunity to reduce the scale of change which a new overhead line would bring. It is considered that, whether or not the proposal constituted major development for this purpose, it would satisfy the tests of PPS7, as noted above, so as to support the exceptional case for development with the AONB.

7.74 Many of the local planning policy considerations, such as the effect on protected sites and species, are considered in greater detail in subsequent chapters in this report.

Conclusions

7.75 The principal matters which can be derived from an analysis of policy at national, regional and local level are :

- at the national level, the need for new energy infrastructure has been established;
- the Holford Rules are supported as the basis for planning new routes for overhead lines;
- national and local policies emphasise that great weight should be placed on the protection of areas statutorily designated for landscape, wildlife or historic value;
- where schemes affect such areas, the need to do so must be established and alternatives properly considered;
- at a local level, specific protection is also afforded to Special Landscape Areas.

7.76 This report considers the potential effects of the corridors on environmental assets and their performance against planning policies can be judged accordingly.

7.77 Corridors 1 and 2 affect the statutorily designated AONB. While the need for the development is clearly established, it is considered that the introduction of an additional overhead line in Corridor 1 would be likely to result in an effect on the landscape and views of the AONB which would contravene national and local planning policies.

7.78 Corridor 2 would involve the replacement of an existing overhead line with one larger in scale and so far as relevant it can be justified as an exceptional case in compliance with policy, where alternatives are shown to have disbenefits and appropriate mitigation can be considered.

7.79 Of those corridors passing outside the AONB, Corridor 3 would be least acceptable in policy terms as it would have a greater effect on locally designated Special Landscape Areas.

8 NATIONAL GRID POLICIES

Stakeholder, Community and Amenity Policy

8.1 National Grid's Stakeholder, Community and Amenity policy[54] includes ten commitments linked to its environmental obligations under Schedule 9 of the Electricity Act. Of particular relevance to the corridor selection stage of the development process are :

- establishing need;
- involving stakeholders and communities;
- routeing of networks and site selection - seeking to avoid areas which are nationally or internationally designated for their landscape, wildlife or cultural significance;
- minimising the effects of works and new infrastructure on communities, by having particular regard to safety, noise and construction traffic, and on areas which are nationally or internationally designated for their landscape, wildlife or cultural significance and other sites valued for their amenity such as listed buildings, conservation areas, areas of archaeological interest, local wildlife sites, historic parks and gardens and historic battlefields (taking into account the significance of these and other areas through consultation with local authorities and other stakeholders with particular interests in such sites); and
- mitigating adverse effects of works - through application of environmental assessment techniques.

8.2 As noted earlier in this report, the need for the proposed connection is set out in the Project Need Case and the preferred approach to system reinforcement in the region has been established by means of strategic optioneering. The corridors were defined, following an assessment of the main environmental constraints, such that they comprised the least environmentally constrained parts of the study area, together with an opportunity corridor based on an

[54] National Grid plc : National Grid's commitments when undertaking works in the UK - our Stakeholder, Community and Amenity policy : February 2010

existing overhead line route. Extensive consultation has been undertaken to obtain views about the Project as a whole and the potential corridors.

Holford Rules

8.3 Broad principles for overhead transmission line routeing were formulated by the late Lord Holford and published in 1959 by the Royal Society of Arts. These rules, known as the 'Holford Rules'[55], were reviewed by National Grid in 1992 and have become accepted within the electricity transmission industry as the basis for overhead transmission line routeing. Their use is supported in the National Policy Statement for Electricity Networks (EN-5). While these rules are intended to inform decisions on detailed overhead line routes, rather than corridors, several are relevant in the latter case :

- Rule 1 - Avoid altogether, if possible, the major areas of highest amenity value, by so planning the route of the line in the first place, even if the total mileage is somewhat increased in consequence;
- Rule 3 - Other things being equal, choose the most direct line, with no sharp changes of direction and thus fewer angle pylons;
- Rule 6 - In country which is flat and sparsely planted, keep the high voltage lines as far as possible independent of smaller lines, converging routes, distribution poles and other masts, wires and cables so as to avoid a concatenation or wirescape;
- Supplementary note A - Avoid routeing close to residential areas as far as possible on grounds of general amenity
- Supplementary note B - Where possible choose routes which minimise the effect on Special Landscape Areas, Areas of Great Landscape and other similar designations of County, district or local value.

8.4 The Holford Rules were applied in the Route Corridor Study process to guide the definition of potential corridors. It is rare that overhead line routes can accord with all of the Rules simultaneously. Rule 1 provides the basis for developing Corridors 3 and 4, whereas Corridors 1 and 2 are the most direct and would therefore perform best against Rule 3. Corridors 3 and 4 would be more

[55] National Grid plc : The National Grid Company plc and new high voltage transmission lines - guidelines for line routeing (the Holford Rules) and undergrounding : March 2003

consistent with Rule 6 as they only converge with existing lines at either end of the corridor.

8.5 Supplementary Note A suggests that Corridor 4 should be preferred as it is most remote from centres of population. This corridor would also be preferred under Supplementary Note B as it would avoid Special Landscape Areas more than the other corridors.

Horlock Rules

8.6 The Horlock Rules[56] set out National Grid's approach to substation siting and design in the context of the company's duties under Schedule 9 of the Electricity Act 1989. Of most relevance to the route corridor stage are :

- Guideline 2 - The siting of new substations, sealing end compounds and line entries should as far as reasonably practicable seek to avoid altogether internationally and nationally designated areas of the highest amenity, cultural or scientific value by the overall planning of the system connections.
- Guideline 3 - Areas of local amenity value, important existing habitats and landscape features, including ancient woodland, historic hedgerows, surface and ground water sources and nature conservation areas should be protected as far as reasonably practicable.

8.7 Only Corridor 2 would require the construction of a new substation. A preliminary siting study has been undertaken based on the Horlock Rules and identified three potential sites, taking the above guidelines into account.

Undergrounding

8.8 National Grid has an established approach to undergrounding. In view of the number of new connections which will need to be developed in the near future and the often-held public views that underground connections would be preferred, National Grid considers that it would be appropriate to reach a new consensus on the approach to be taken to undergrounding. National Grid is therefore currently seeking views from industry, government, non-governmental

[56] National Grid plc : NGC substations and the environment - guidelines on siting and design : March 2003

and environmental stakeholders as well as from the public on the approach it should take in the future. Following consultation, an updated approach will be adopted, which will be used in determining whether there is a case for undergrounding part of the connection between Bramford and Twinstead Tee.

8.9 Although National Grid's current approach to undergrounding states that every case for using underground cables for amenity reasons will be considered on its merits, its guidelines[57] identify those "exceptionally constrained areas" where physical or amenity factors related to landscape, land use and development weigh most heavily against the use of overhead lines and therefore where consideration of underground cables may be warranted.

8.10 "Exceptionally Constrained Rural Areas" comprise those locations within or immediately alongside nationally or internationally designated areas of amenity value (National Parks, Areas of Outstanding Natural Beauty, Heritage Coasts and World Heritage Sites) where the scale of new high voltage transmission pylons and conductors would dominate unspoilt landscape and cause serious damage to major open views of spectacular panoramas, crests of prominent rides and skylines or attractive small scale valleys seen from important locations within or immediately alongside the designated areas.

8.11 Corridors 1 and 2 pass through the AONB. A 400kV overhead line and a 132kV overhead line run in parallel through this part of the AONB and both lines were present at the time of AONB designation.

8.12 The current approach requires that the potential use of underground cable in, or close to, exceptionally constrained areas is shown to be the most cost effective means of avoiding the need for high voltage overhead lines which would seriously harm the amenity of these areas. Consideration would also have to be given to the adverse effects on amenity of underground cables, sealing end compounds, terminal towers and ancillary equipment and to technical considerations that apply.

[57] National Grid plc : Undergrounding policy - approach to new connections : August 2009

Stage 1 Consultation Representations

8.13 Most concerns raised in consultation representations relating to National Grid policies questioned the application of the Holford Rules to the various corridors and how the undergrounding policy should be applied. Several Parish Councils, including those associated with the Groton Pylon Alliance local interest group, considered that Corridors 3 and 4 breached the Holford Rules, because they do not follow the most direct line and would involve the use of more angle pylons (perceived as being particularly intrusive in the open landscapes of these corridors), while others suggested that Corridors 1 and 2 were in conflict with Rule 1 because they pass through the AONB. Chattisham and Hintlesham Parish Council[58] also considered that the additional wirescape associated with Corridor 2 would contravene Rule 6. The Stour Valley Underground local interest group also cited[59] the additional wirescape associated with all the corridor options affecting their area of interest as a contravention of the Holford Rules.

8.14 The assessment of each corridor against the Holford Rules is dealt with in Chapter 10. The Holford Rules are a set of guidelines which are used as a tool in designing and assessing potential overhead line routes. They are not prescriptive and conflicts will inevitably arise with the Rules in particular circumstances. .

8.15 Undergrounding was viewed by some respondents as a way of circumventing the Holford Rules. While many had strong views on the potential for undergrounding there was little challenge to National Grid's policy and guidelines. Indeed the application of the policy and guidelines was seen as justifying undergrounding through the AONB (if not other parts of the study area).

8.16 Undergrounding is discussed further in Chapters 10 and 17.

[58] Chattisham and Hintlesham Parish Council public consultation response : February 2010
[59] Stour Valley Underground public consultation response : February 2010

Conclusions

8.17 On the basis of National Grid policy, particularly the Holford Rules, alone, Corridor 4 would be preferred as it is furthest from the AONB and would have no direct impact upon it. National Grid's current approach to undergrounding would suggest that undergrounding could be considered for Corridors 1 and 2 which pass through an "exceptionally constrained" rural area (the Dedham Vale AONB) and for the western end of Corridors 3 and 4 which are close to the AONB and form part of a unit managed by the Dedham Vale and Stour Valley AONB Partnership. However this will be reviewed at Stage 2 in the light of an updated undergrounding policy which will then be available.

9 STAGE 1 CONSULTATION REPRESENTATIONS

Introduction

9.1 The extensive Stage 1 Consultation exercise sought inputs from stakeholders and the wider public. This section of the report summarises the representations from different parties, focussing on the main issues raised and their views on particular corridors. Further information is presented in the Stage 1 Feedback Report. The Stage 1 Feedback Report reviews in detail the issues raised by respondents, how these have been taken into account to date and how they will influence the development as it progresses. The way in which specific issues have been taken into account is also addressed in the topic chapters of the present report (for example, landscape issues are dealt with in Chapter 10).

Local planning authorities

Suffolk County Council

9.2 The whole of the corridors lie within Suffolk County Council's administrative area, with the exception of the sections to the west of the River Stour. The County Council considered that all of the proposed corridors would cause severe damage to the environment of South Suffolk and that National Grid had not yet demonstrated conclusively that a scheme such as that proposed is the most appropriate means of achieving the required network enhancements. It

resolved[60] that "*if, after completion of a further full review of alternatives by National Grid, the Infrastructure Planning Commission ultimately accepts the case for a new overhead line in this area, routes 3 and 4 should be ruled out as they would traverse extensive areas of countryside currently free from pylon intrusion and that there is insufficient justification for the installation of a third line of pylons as proposed in option 1*".

9.3 The County Council further resolved that it "*considers that corridor 2b would cause the least environmental damage, but that any parts of a new line running through the sensitive Dedham Vale Area of Outstanding Natural Beauty, the crossing of the Stour Valley south of Sudbury and the immediate setting of these areas should be undergrounded; and that, to compensate at least in part for adverse environmental impact elsewhere and to maximise the environmental benefit, lengths of the existing 400kV line within these areas and their settings should also be undergrounded*".

Essex County Council

9.4 The short sections of corridors to the west of the River Stour, including the area around Twinstead Tee, lie within Essex County Council's area. The County Council expressed no preference on the four corridors. However it did express the view[61] that the only acceptable transmission line proposal connecting to Twinstead Tee across the Stour Valley in Essex would be by undergrounding.

Mid Suffolk District Council

9.5 Bramford substation is situated in Mid Suffolk District and short sections of Corridors 3 and 4, in the vicinity of Flowton, also lie within its area. The Council strongly opposed[62] Corridors 3 and 4 on the grounds that they would "*have a serious adverse impact upon that generally undeveloped ancient countryside landscape and will have a harmful impact upon the historic built environment of those localities and the settings of listed buildings thereabouts*". It considered that Corridor 2 would have the lowest likelihood of adverse impacts and would be the Council's preferred option.

[60] Suffolk County Council : Minutes of Cabinet : 2 February 2010
[61] Essex County Council Environment, Sustainability and Highways : Executive decision : 28 February 2010
[62] Mid Suffolk District Council :Planning Committee A : 3 February 2010

Babergh District Council

9.6 Babergh Council's area extends to the whole of the corridors, with the exception of the sections to the west of the River Stour and the western end of the corridors close to Bramford substation. Like Suffolk County Council, the authority considered that National Grid had not demonstrated conclusively that the current proposals are the most appropriate means of achieving the required network improvements. It urged that the options for offshore and underground routing should be fully explored before any consideration is given to over ground routing in any form. In the absence of such a study the District Council felt unable to support any of the proposals. Subject to that caveat, the authority indicated[63] that it strongly objects to the use of Corridors 1, 3 and 4 in any form and that, were Corridor 2 to be selected, "*steps be taken to lessen the impact of any power line by under grounding the cables*".

Braintree District Council

9.7 Braintree Council's area includes short sections of corridor to the west of the River Stour, including the area around Twinstead Tee. As with Essex County Council, it expressed no preference on the four corridors and expressed the view[64] that the only acceptable transmission line proposal connecting to Twinstead Tee across the Stour Valley in Essex would be by undergrounding.

Dedham Vale AONB and Stour Valley Partnership

9.8 The Dedham Vale AONB and Stour Valley Partnership works on behalf of a range of largely public sector organisations to implement the Management Plan for the Dedham Vale AONB and Stour Valley. In a detailed response, it concluded that it could not support any of the corridor options proposed by National Grid as two pass through the AONB and all four pass through the Stour Valley. It considered[65] that "*there is overwhelming national, regional and local policy advising against such development in a protected landscape and within the setting of a protected landscape" and that "there are specific localised sensitivity*

[63] Babergh District Council : Strategy Committee : 11 February 2010
[64] Braintree District Council : Halstead Local Committee : 20 January 2010
[65] Dedham Vale AONB and Stour Valley Partnership : response to National Grid Bramford-Twinstead 400kV overhead line project : January 2010

issues within the Dedham Vale AONB and Stour Valley which make the proposals unacceptable".

Other Statutory Bodies

English Heritage

9.9 As the Government's adviser on heritage issues, English Heritage concluded[66] that Corridor 2 potentially would cause the least damage to the settings of heritage assets. In respect of Corridor 1 it considered that "*the presence of three lines would cause further adverse impacts to the settings of listed buildings and conservation areas and views in and out of the latter, which are already to a large degree badly affected*". It also concluded that the potential adverse impacts that would be received by heritage assets in or adjoining Corridors 3 or 4 would be of such significance that neither should be selected for further consideration.

Environment Agency

9.10 No formal response was received from the Environment Agency.

Natural England

9.11 As the Government's adviser on landscape and nature conservation issues , Natural England determined[67] that Corridor 1 would have significant adverse landscape and visual impacts on the nationally important landscape of Dedham Vale AONB and its setting, which would be likely to compromise the purposes of its designation. It considered that the installation of a new line in either Corridor 3 or 4 would result in a significant adverse impact on the local landscape character. Natural England concluded that Corridor 2 "*would minimise the scale of change on the landscape*", though it sought further information at Stage 2 relating to options at the eastern end of the corridor and relating to the additional Grid Supply Point. It also wanted to see a full appraisal of undergrounding of the transmission line in appropriate locations.

[66] English Heritage : consultation response : 15 March 2010
[67] Natural England : consultation response : 25 February 2010

Parish Councils

9.12 Representations were received from 41 Parish Councils, 19 of whom were represented by the Groton Pylon Alliance. Many of the issues raised in their consultation representations understandably related to specific concerns about the impact of one or other of the corridors on their local landscape, views, heritage or nature conservation assets. In most cases it should be possible to design alignments in such a way as to avoid, or limit the impact upon, particular features or views. In these cases, the issue would not affect corridor selection. There are however some examples where such an approach would be unlikely to resolve the issue and which could affect corridor selection. Such issues are dealt with in other chapters of this report.

9.13 A number of issues were common to several of the Parish Council representations, including : the relationship with planning policies and the Holford Rules; the visual impact of overhead lines and the need to consider undergrounding and other alternatives; impact on wildlife and habitats; health concerns; impact on property values; impact on tourism and the local economy; restrictions on agricultural operations and farm diversification; and impact on agri-environmental schemes.

9.14 The stated preferences of parish and town councils is shown in Table 9.1.

Table 9.1 : Corridor preferences - Parish Councils

Corridor	Number of parishes	
	Clear preference	Least worst option
1	1	
1 or 2	3	
2	7	15
3		
4	1	1
No preference	3	
Object to all	10	

9.15 In stating Corridor 2 to be their preferred corridor or the 'least worst option', parish councils generally requested that the overhead line should be placed underground especially in the most sensitive areas such as the AONB. Common comments on Corridors 3 and 4 were that they would "*blight unspoiled countryside*" and "*would involve breaches of Babergh's planning policies, National Grid's statutory duties and their own Holford Rules*". It was considered that Corridors 3 and 4 would have a negative impact on an ancient unspoilt landscape, particular views, specific settlements, cultural heritage, the local economy, local wildlife, woodland and biodiversity and the local economy.

9.16 Those parish councils that opposed Corridors 1 and/or 2 believed that local settlements and the environment are already significantly blighted by the existing overhead lines, and that a new overhead line would increase this blight and further impact on the AONB. In particular it was considered that a third row of overhead lines, as would result in Corridor 1, could not be justified.

Non-statutory and other pre-existing local bodies

9.17 A number of non-statutory and other bodies, established prior to the connection proposal being mooted, responded to the proposals by National Grid. Their views may be summarised as follows :

9.18 The Campaign to Protect Rural Essex rejected[68] all four corridors in favour of undergrounding. It was particularly concerned by the potential impact on the Stour Valley and the area between the river and Twinstead Tee.

9.19 The Colne Stour Countryside Association opposed[69] all four corridors on the grounds that other alternatives (including tunnelling and subsea cables) should have been considered.

9.20 The Dedham Vale Society expressed[70] no preference but indicated that other alternatives (including tunnelling and subsea cables) should have been considered.

[68] Campaign to Protect Rural Essex : consultation response : 17 February 2010
[69] Colne Stour Countryside Association : consultation response : 26 February 2010
[70] Dedham Vale Society : consultation response 28 February 2010

9.21 Suffolk Preservation Society[71] is a long established conservation organisation. It contends that in principle all of the proposed corridors would be unacceptable, if they are to employ overhead lines. It does not believe that "*the introduction of additional blight along corridors 3 and 4 should ever be contemplated*" and urges "*as forcibly as possible that neither of these options is pursued in any circumstances*". While these routes do not cross the AONB, the Society considers that they would be visible from it and so would do much to "*negate the wonderful landscape and adversely impact upon important historic buildings and areas along these corridors*". It notes that there is also much local concern over these routes and due note should be afforded to local opinion. The Society advocates underground solutions for Corridors 1 and 2 to avoid conflict with AONB objectives and improve the situation around Hintlesham.

9.22 The National Farmers Union expressed[72] concern at a lack of information on undergrounding and its potential effects and on the impact of overhead lines on agricultural operations and farm businesses and on the health of those living and working near them. No corridor preference was expressed.

9.23 The Suffolk Wildlife Trust preferred[73] Corridor 2A but commented that County Wildlife Sites should have been considered in defining corridors. The Trust was also concerned that there should be no net loss of biodiversity.

9.24 The Royal Society for the Protection of Birds[74] indicated a preference for Corridor 4. In indicating this preference, their representation highlighted that Corridor 1 is considered to be their least preferred corridor as it would add further to the dissection of a SSSI and ancient woodlands between Ramsey and Hintlesham Great Wood. The organisation also indicated that it would not favour Corridors 2 and 3 because of the potential effect on ecological connectivity.

General Public

9.25 The proposal elicited significant interest from the local communities in the study area. More than 11,000 households within Consultation Zone 1 were directly

[71] Suffolk Preservation Society : consultation response : 25 February 2010
[72] National Farmers Union : consultation response 26 February 2010
[73] Suffolk Wildlife Trust : consultation response : 17 February 2010
[74] Royal Society for the Protection of Birds : consultation response : 25 August 2009

mailed information about the project. Over 1,900 people attended at least one of the public consultation events and 3,023 pieces of feedback were received via different feedback mechanisms on the proposed corridor options. 1,819 individuals expressed their corridor preference on consultation feedback forms.

9.26 The corridor preference, derived from an analysis of responses on consultation feedback forms, is shown in Table 9.2.

Table 9.2 : Corridor preferences - public response

	Representations indicating preference		
Corridor	Unconditional	With caveat	Total
1	231	112	343
2	689	782	1471
3	52	14	66
4	99	78	177

9.27 Little weight can be attached to the absolute numbers responding in a particular way, because it is more important to consider the specific reasons and issues related to corridor preference. However it is notable that the publicly expressed view corresponds closely with that of the statutory bodies and other stakeholders i.e. that Corridor 2, with an element of undergrounding, should be the preferred option. As noted above, it is the specific issues raised by the public in relation to each corridor that are of greater relevance to the decision-making process. As with the Parish Councils, a large number of location-specific issues were raised, which in the main are the type of issues which appear to apply equally to any of the corridors and would be more appropriately addressed in the detailed connection design. They have however been reviewed to determine whether any may have a bearing on corridor selection.

9.28 It is also worth noting that many people stated caveats when indicating their preference for one or more of the corridors. In the main these caveats related to the corridor preference being subject to full or partial undergrounding. Over

150 respondents stated their opposition to all four corridors, or expressed their general opposition to overhead lines.

9.29 Those **supporting Corridor 1** mainly cited as considerations the fact that it would follow the route of existing overhead lines and would be a more straightforward option than some of the others. It was considered that selecting Corridor 1 would prevent pylons impacting other areas which were currently unspoilt. Respondents stated that they felt Corridor 1 would have the least impact or would cause the least amount of disruption to people and the environment. One reason given by respondents in support of Corridor 1, which differentiated it from Corridor 2, was that there would be no requirement for a substation as would be the case with Corridor 2.

9.30 Those **supporting Corridor 2** considered that it would be better to use a corridor where there are already pylons in position, than to impact unspoilt countryside. It was noted that people, including local residents, were used to seeing pylons in this area and some commented that they considered the area to be already blighted. It was noted that the number of new pylons would be minimised by replacing one row of pylons with another. There was a sense amongst respondents that Corridor 2 would have a limited visual impact in addition to that of the existing infrastructure, although some insisted that Corridor 2 was preferable even if the new infrastructure would be taller than the existing 132kV pylons. Of those respondents that expressed a preference for Corridor 2, over half cited environmental reasons for this preference. Some thought the impact on the countryside, or the visual impact more generally, would be limited, particularly in comparison to other proposed corridors

9.31 Many of those respondents who supported Corridor 2 with caveats stated that they would prefer no new overhead lines at all but that Corridor 2 was the 'least worst' of the proposed corridors. Over 500 of the respondents that reluctantly preferred Corridor 2 sought for as much of the connection as possible to be installed underground. In particular, there was a strong desire for the cables to be buried underground where they would impact sensitive areas, including specifically the AONB.

9.32 During the Stage 1 Consultation respondents were not directly asked their preference in regards to the sub-options of Corridor 2 - this will form part of the Stage 2 Consultation should Corridor 2 be selected. However some did express

preferences. More respondents had a specific preference for Corridor 2 Option B than for Corridor 2 Option A. Of the 131 who preferred Corridor 2 Option B, most did so on the grounds that it would impact fewer people and some noted that it would avoid Hintlesham and Chattisham. Over 100 respondents supported Corridor 2 Option B on the grounds that it involved the removal of an existing stretch of overhead line from the area between Hintlesham and Chattisham, which they deemed beneficial to the local community.

9.33 Those **supporting Corridor 3** mainly expressed a preference for this corridor because of the directness of the route, commenting that no new substation would be required and that it would be the least expensive option. Some respondents commented that it would have less impact on residential areas than other routes and that it would avoid the AONB

9.34 Those **supporting Corridor 4** mainly did so because they considered the corridor to be less populated than others and therefore fewer people would be affected. Some expressed support for Corridor 4 because : there would be no need for an additional substation; it would prevent the cumulative impact associated with Corridors 1 and 2; and it would be furthest from respondents' homes. A small number of respondents preferred Corridor 4, because it would be furthest away from existing lines and from specific locations such as Hadleigh, Polstead and Hintlesham.

9.35 As with Corridor 3, many of those preferring Corridor 4 did so because it would avoid overhead lines running through the AONB. Many also thought that it would have less impact on SSSIs and SLAs than other corridors. It was argued that the topography along Corridor 4 would make it easier to shield the pylons and respondents noted that this route was preferred by the environmental consultants at the Route Corridor Study stage.

9.36 The level of objection to specific corridors is shown in Table 9.3.

Table 9.3 : Corridor objections - public response

Corridor	Number of representations objecting
1	83
2	75
3	1008
4	1013

9.37 Those expressing their **opposition to Corridor 1** mainly cited the effects that three overhead lines would have on the countryside, including the impact on the AONB and Ramsey and Hintlesham Woods. Concerns were raised about the impact that on specific locations, including Hadleigh, Assington, Upper Layham, Burstall and Twinstead. It was considered that construction of pylons in Corridor 1 would be in breach of the Holford Rules, specifically Rule 6 relating to creation of a wirescape. Concerns were also expressed about health risks, the impact on local business and the proximity to a respondent's property.

9.38 Only a small number of respondents expressed their **opposition to Corridor 2** specifically. A greater number were opposed to both Corridors 1 and 2. Those objecting to Corridor 2 raised similar issues to Corridor 1 but were also concerned by the effect on property values.

9.39 Some raised concerns about the proposal for the new substation which would be required if Corridor 2 were selected. These related to visual impact, the connection of 132kV overhead lines and general noise and traffic disturbance during the operation of the substation and the construction phase.

9.40 Over 1,000 respondents expressed their **opposition to Corridors 3 and 4**. This was often associated with stated support for the Groton Pylon Alliance (see below). Many did not distinguish between Corridors 3 and 4 when describing their concerns. Most were concerned that overhead lines in either of these corridors would be detrimental to areas of countryside which were described as beautiful and unspoilt. There was significant anxiety about visual intrusion and

the impact of overhead lines on the skyline, on specific "iconic" views or on the setting of villages, most of which included heritage features such as conservation areas and listed buildings.

9.41 Some expressed concern over the potential impact on designated environmental areas such as Sites of Special Scientific Interest (e.g. Milden Thicks), County Wildlife Sites and nature reserves (e.g. Wolves Wood). The effect on woodland habitats was a particular concern.

9.42 Many respondents cited recreation and tourism as important contributors to the local economy and were concerned that an overhead line would make the areas around Corridors 3 and 4 less attractive to visitors and therefore impact upon the local tourism economy.

9.43 Other notable concerns related to Corridors 3 and 4 included impacts on property values, health, agricultural operations and aviation. Many respondents commented that developing in either corridor would be contrary to planning policy and inconsistent with the Holford Rules.

9.44 Specific **opposition to Corridor 3** was expressed with reference to locations along this route, notably Kersey, Boxford, Hadleigh, Groton and Aldham. Reference was made to effects on a locally designated Special Landscape Area.

9.45 Specific **opposition to Corridor 4** was expressed with reference to locations along this route, including Chelsworth, Monks Eleigh, Whatfield, Lindsey Tye, Stackyard Green, Milden Thicks, Wattisham, Whatfield and Upsher Green. Many argued that Corridor 4, in particular, followed high land which would result in pylons being visible for many miles.

9.46 A number of local interest groups were formed in response to National Grid's proposals.

9.47 Bury not Blight rejected[75] all four corridors in favour of undergrounding, as overhead lines would "*needlessly erode the special character and quality of*

[75] Bury Not Blight : consultation response : February 2010

Suffolk's landscape". The group was particularly concerned that Hintlesham and other villages should not be blighted by additional pylons.

9.48 Groton Pylon Alliance represents 19 Parishes who would be affected by Corridors 3 and 4. The Alliance considered[76] that "*the proposals for Corridors 3 and 4 are the most damaging for the countryside, creating as they would a new scar on a beautiful and notably unspoilt landscape*" and that "*relatively speaking, Corridor 2B is the least worst solution, involving as it does the upgrading of existing infrastructure*". It also seeks to ensure that, if Corridor 2 is selected, as much as possible is done to mitigate its effects, including "*using modern technology*", adopting Corridor 2B to reduce the effects on those living in south Hintlesham and undergrounding in sensitive areas such as the AONB.

9.49 Stour Valley Underground, as its name suggests, promotes underground and under sea solutions and did not support[77] any of the corridors.

9.50 Two on-line petitions were set up to object to National Grid's proposals. One, linked to Bury not Blight, asks the government to force National Grid to underground the connection from Bramford to Twinstead Tee to protect the Suffolk landscape from further blight. The other, linked to Stour Valley Underground, also calls for undergrounding and for investment in subsea technology.

Conclusions

9.51 The analysis of the representations made during the Stage 1 Consultation made it clear that the selection of Corridors 3 and 4 was least favoured either by the general public or key stakeholders. Corridor 2 was identified as the least worst preference by a large proportion of the public and statutory and non-statutory bodies, though in the majority of cases subject to the provision that undergrounding of some or the entire route would be considered. There was significantly less public support for Corridor 1, which was also not favoured by statutory and non-statutory bodies.

[76] Groton Pylon Alliance : consultation response : February 2010
[77] Stour Valley Underground : consultation response : February 2010

9.52 An important factor influencing the stated preferences appears to be the opinion that the replacement of an existing overhead line, albeit with another line larger in scale, would be preferable to introducing a new overhead line into an area not currently affected by such infrastructure. While the introduction of a new overhead line through an AONB was not welcomed, less weight appears to have been attached to this factor. It also appears that respondents considered that the nationally designated status of the AONB would provide greater support for the undergrounding of at least part of a route passing through the area.

10 LANDSCAPE AND VIEWS

Introduction

10.1 This section of the report considers the potential effects of the corridors on the landscape and on views. This chapter considers the wider landscape including the statutorily designated Dedham Vale AONB and the locally designated Special Landscape Areas.

Context

Topography

10.2 The area comprises a broadly flat plateau at around 60-80mAOD intersected by the valleys of the River Stour, the River Box, the River Brett and Flowton/Belstead Brook. These watercourses give rise to lower lying valleys surrounded by areas of higher ground. The river valleys run in a broadly north north-west to south south-east direction through the area with the Rivers Stour, Box and Brett joining together to the south to give rise to the important lowland river valley landscape designated as the Dedham Vale AONB.

Landscape Character

10.3 The entire study area falls within the South Suffolk and North Essex Clayland national landscape character area. The national landscape character

assessment document[78] describes the area as a broadly flat plateau intersected by undulating river valleys supporting predominantly arable crop production with some pasture within the valleys. Small settlements around tyes (commons), farmsteads and moated sites are scattered throughout the area, with buildings often timber-framed and colour-washed and churches are notable. There are few large woods, but smaller woods, including ancient coppice, and trees and hedgerows join together to give rise to some wooded skylines, with others bare ridgelines. There is a network of winding roads with characteristic sunken lanes.

10.4 The landscape character of the area is closely related to the river valleys, comprising the water courses and the river valleys, and the 'interfluves' which comprise the higher land between the rivers. The study area includes the counties of Suffolk and Essex and landscape character assessments for both counties reflect these valley and interfluve landscapes. The following descriptions are summarised from these published assessments.

Dedham Vale AONB

10.5 Dedham Vale AONB straddles the Suffolk-Essex border along the River Stour. It is designated as an exceptional example of a lowland river valley. Picturesque villages, rolling farmland, slow meandering rivers, water meadows and ancient woodlands combine to create an example of the traditional English lowland landscape. The area has a rich history and has been the inspiration of many writers and painters, notably Constable. The history of the area has led to the AONB being designated not only for its landscape but also for its cultural significance.

10.6 The designated area of the AONB stretches upstream from Manningtree to within one mile of Bures covering an area of approximately 90km^2. It also covers the Box valley as far north as Boxford. It extends into the study area in its northern extent where the existing 132kV and 400kV overhead lines between Bramford Substation and Twinstead Tee pass through approximately 3km of the AONB to the north west of Polstead. The original AONB designation was made in 1970 and extended as far as a line running roughly north-east/south-west through Stoke by Nayland. The remaining area, including the area through

[78] Natural England : National Character Areas : 2005

which the existing 400kV and 132kV overhead lines pass, was designated in 1976. This part of the AONB was therefore designated with these overhead lines in place.

10.7 The primary purpose of AONB designation, as stated in the National Parks and Access to the Countryside Act 1949[79], is to "*conserve and enhance the natural beauty*" of the area.

10.8 The Overarching National Policy Statement for Energy (EN-1) states that the conservation of the natural beauty of the landscape and countryside should be given great weight by the Infrastructure Planning Commission in deciding on applications for development consent in areas such as AONBs. However it goes on to note that the Infrastructure Planning Commission may, exceptionally, grant consent to development in these areas, if the development is demonstrated to be in the public interest, subject to various assessments being carried out and to high environmental design standards being adopted.

10.9 Local planning policies accept that it may be necessary to locate major utilities, including overhead lines in the AONB, but they do require need to be proven and alternatives to be assessed and that they be designed to minimise their impact on the AONB.

10.10 The Holford Rules (Rule 1) states that overhead transmission lines should be planned to avoid altogether areas of highest amenity value such as AONBs, even if the total mileage is somewhat increased in consequence. The Rules do not preclude all consideration of routes in an AONB.

10.11 The guidelines attached to National Grid's current undergrounding policy identify locations within or immediately alongside AONBs as "exceptionally constrained areas" where consideration of underground cables may be warranted where "*the scale of new high voltage transmission towers and conductors would dominate unspoilt landscape and cause serious damage to major open views of spectacular panoramas, crests of prominent rides and skylines or attractive small scale valleys seen from important locations within or immediately alongside the designated areas*".

[79] National Parks and Access to the Countryside Act 1949 c97

Special Landscape Areas (SLA)

10.12 Special Landscape Areas are not statutory designations but are identified by local planning authorities as valuable landscapes within the local area, with specific policies affording their protection. Although contemporary central government planning advice (Planning Policy Statement 7) presumes against their retention, their local value has been emphasised in representations received during the Stage 1 Consultation process.

10.13 Several areas of land within the Babergh District Council Local Plan and the Braintree District Local Plan are designated as Special Landscape Areas (SLAs). These SLAs spread northwards from the Dedham Vale AONB in swathes following the valleys of the Rivers Stour, Box, Brett and Belstead Brook.

Historic Landscape Characterisation

10.14 The Suffolk Historic Landscape Characterisation map[80] has identified and defined a set of historic landscape character types based on current land use and an assessment of its historical origin. The study area, and much of south Suffolk, predominantly comprises Pre-18th Century Enclosure which is land which was enclosed for agriculture before 1700. This landscape of 'ancient enclosure' shows little evidence of change however it includes pockets of 18th Century and Later Enclosure and Post 1950 Agricultural Landscape where the character has been altered as a result of agricultural changes in the post war period, for example the weakening or removal of hedgerows and the conversion of meadow land to arable crop production.

10.15 Meadow or Managed Wetland is also found along the river valleys of the Stour, Box, Brett and Belstead and small pockets of ancient woodland are dispersed through the study area.

10.16 To the west there is greater evidence of 18th Century and Later Enclosure. This together with areas of Post 1950 Agricultural Landscape, Horticulture (Orchard), Common Pasture and Post Medieval Park and Leisure gives rise to a more modern field pattern.

[80] Suffolk County Council : Suffolk Historic Landscape Characterisation Map : 2009

Settlements

10.17 The town of Sudbury lies to the west of the study area, with Hadleigh to the centre and Bramford and Sproughton to the east of Bramford substation. There are numerous villages dispersed throughout the area, with the river valleys supporting many of the transport corridors and subsequently the majority of the settlements. Many of the settlements date from medieval times and contain numerous Listed Buildings often with a designated Conservation Area. In addition there are many scattered dwellings typically along the minor road network.

Views

10.18 Views within the study area vary dependent on the location and orientation of the receptor, topography and the presence of vegetation including woodlands, tree belts and hedgerows. In general terms there are more views to and from the higher open plateau areas whereas views to and from the lower lying river valleys are more restricted by land form and vegetation.

Stage 1 Consultation Representations

10.19 Suffolk County Council[81] noted its concern that an overhead line in any corridor would cause severe damage to the environment of South Suffolk. It stated that Corridors 3 and 4 should be ruled out as they would traverse extensive areas of countryside currently free from pylon intrusion. The committee report noted that "*Corridors 3 and 4 pass through areas of unspoilt Suffolk countryside largely designated as Special Landscape Areas by the Local Planning Authorities. These corridors also cut across the landform and a series of landscape types including river valleys, rolling farmland and plateaus that have retained much of their historic pattern and many of their traditional features. These landscapes provide the setting to a number of historic small towns and villages such as Boxford, Groton, Kersey, Monks Eleigh, Semer, Chelsworth, Aldham and Whatfield, and create a series of iconic views for which the area is well known to residents and visitors*."

[81] Suffolk County Council public consultation response Cabinet resolution 2 February 2010

10.20 The County Council considered that there is insufficient justification for the installation of a third line of pylons as proposed in Corridor 1. It considered that Corridor 2b would cause the least environmental damage, but that any parts of a new line running through the sensitive Dedham Vale Area of Outstanding Natural Beauty, the crossing of the Stour Valley south of Sudbury and the immediate setting of these areas should be undergrounded.

10.21 The County Council further suggested that, to compensate at least in part for adverse environmental impact elsewhere and to maximise the environmental benefit, lengths of the existing 400kV line within these areas and their settings should also be undergrounded. The particular areas where officers of the County Council, other planning authorities and other statutory consultees consider that undergrounding part of the connection would bring greatest benefit has been explored in a workshop (see Chapter 17).

10.22 Essex County Council is of the opinion[82] that the adverse effect on views from a new above ground transmission line crossing of the Stour Valley south of Sudbury in Essex would be significant enough to warrant undergrounding. This view was supported by Braintree District Council[83].

10.23 Babergh District Council made no specific reference to the AONB but resolved[84] to object to the proposals "*in the absence of a conclusive study which demonstrated the need for a new overhead line*". Whilst not wishing to offer any support for the project, Members also indicated that if National Grid had to select a corridor they would favour Corridor 2 with significant sections being placed underground. The Council expressed its strong opposition to Corridors 1, 3 and 4.

10.24 Mid-Suffolk District Council stated[85] its strong opposition to Corridors 3 and 4 based upon the "*serious adverse impact upon that generally undeveloped ancient countryside*" and upon the historic environment. The Council encouraged the consideration of undergrounding, particularly in the Area of Outstanding Natural Beauty.

[82] Essex County Council public consultation response : February 2010
[83] Braintree District Council public consultation response : Halstead Local Committee : 20 January 2010
[84] Babergh District Council public consultation response Strategy Committee 11 February 2010
[85] Mid-Suffolk District Council public consultation response : Planning Committee A : February 2010

10.25 The Government's adviser with statutory responsibility for landscape in general, and AONBs in particular, is Natural England. Natural England concluded[86] that Corridor 1 "*would have significant adverse landscape and visual impacts on the nationally important landscape of Dedham Vale AONB and its setting, which would be likely to compromise the purposes of its designation*". In respect of Corridor 2, it noted that this would minimise the scale of change on the landscape, commenting that "*All the route corridor options presented have adverse environmental impacts. Natural England considers that Option 2 has the least impact*." However, it recognised that there would be an impact from Corridor 2 and wanted to see full consideration being given to how this impact can be mitigated. It advised the removal of the 132kV line before the installation of the 400kV line (which it can be confirmed would be the case) and sought a full appraisal of undergrounding of the transmission line in appropriate locations while appreciating that undergrounding also has an environmental impact. It proposed further investigation of routes in the Hintlesham area.

10.26 Natural England noted that Options 3 and 4 "*both run through the historic landscape of south Suffolk, including several Special Landscape Areas, which are currently devoid of overhead transmission lines. We consider that the installation of a new line in either route corridor 3 or 4 would result in a significant adverse impact on the local landscape character*."

10.27 The Dedham Vale and Stour Valley AONB Partnership is a partnership between local authorities, government agencies, national organisations and local people, with the aim of conserving and enhancing the special qualities of the area. It is responsible for producing a Management Strategy for the AONB and for an additional area of land to the west in the Stour Valley. This organisation takes the view that there is overwhelming national, regional and local policy advising against such development in a protected landscape and in the setting of a protected landscape and that Corridors 1 and 2 should have been discarded prior to consultation. It considers that the landscape character types present in the Dedham Vale AONB and in the Stour Valley are not able to absorb the proposed infrastructure development without significant negative impact and that such a development would compromise the management plan objectives for the AONB.

[86] Natural England public consultation response : 25 February 2010

10.28 Representations were received from 41 Parish Councils. Many included specific references to local issues and valued features including historic areas and views to buildings, particularly churches. Many representations made reference to Special Landscape Areas and relevant policies in local plans to protect areas from development that adversely affect landscape character.

10.29 The Dedham Vale Society is a local body which was influential in securing the designation of the AONB and works to protect and enhance the natural and architectural beauties and amenities of the area. It is currently pressing for the extension of the AONB to Bures and Lamarsh - all of the proposed corridors would pass through this area. The Society agrees[87] with the views of the AONB Partnership regarding further intrusion into the AONB and argues for further consideration to be given to undergrounding, to include as a minimum both the section within the designated AONB and the section within the Society's proposed AONB extension area.

10.30 On the other hand Groton Pylon Alliance[88], a local interest group mandated by 19 Parish Councils, has specifically questioned the quality of that section of the AONB through which the existing overhead lines pass, on the grounds that structures and large scale industrial buildings associated with intensive orchard production methods exist in that area. It contends that such factors contribute to its judgment that the relative poor quality of that section of the AONB "*outbalance[s] the possible impact of upgrading an existing overhead line through a short section of the AONB*".

10.31 The Groton Pylon Alliance stated that a new overhead line in Corridors 3 or 4 would result in huge adverse visual impact on highly valued and largely unspoiled landscapes of the Box, Brett and Gipping valleys, with a new overhead line running east-west against grain of landscape and along relatively high ridges. It considered Corridors 3 or 4 would require more of the larger 'angle pylons' required where a new overhead line changes direction. It stated that a new line in Corridors 3 or 4 would be seen along its whole length for many miles to north and south and would be visible from Corridors 1 and 2 and the AONB. It would impact on historic landscape character and iconic views around

[87] Dedham Vale Society public consultation response : February 2010
[88] Groton Pylon Alliance public consultation response : February 2010

Boxford, Groton, Sherbourne Street, Kersey, Semer, Lindsey Tye, Milden, Chelsworth and Lavenham.

10.32 The Groton Pylon Alliance contended that, contrary to the Route Corridor Study's findings, Corridors 3 or 4 are highly environmentally constrained crossing Special Landscape Areas and would breach planning policies, National Grid's statutory duties and the Holford Rules. The Alliance commissioned consultants LDA Design to undertake an assessment of the Route Corridor Study and comparison of the corridors. The LDA Design report concludes that effects on landscape and views would be greater from a new line in Corridors 3 or 4 than in Corridors 1 or 2 and that the effect on Corridors 1 and 2 could be mitigated by it being placed underground in sections through or near to sensitive areas.

10.33 Bury Not Blight made representations[89] focused on the relative benefits of underground cables as compared to overhead lines. It referred to the special character and quality of Suffolk's landscape, the avoidance of conflict with the Holford Rules if undergrounding is used and the prevention of blight to villages such as Hintlesham.

10.34 The Campaign to Protect Rural Essex referred in its response[90] to its preference for use of underground cables and noted the high sensitivity of landscape the corridors cross; the effect of pylons on the beauty and tranquillity of the landscape; and the open, rural character of the Stour Valley and the area between the river and Twinstead Tee which would be compromised by another overhead line.

10.35 The Colne Stour Countryside Association referred in its response[91] to environmentally preferable underground cables or alternatives that avoided an overhead line between Bramford and Twinstead Tee.

10.36 Stour Valley Underground focused on the need for National Grid to consider alternatives to an overhead line between Bramford and Twinstead Tee, including underground cables for environmental reasons and opined that the proposal for

[89] Bury Not Blight public consultation response : February 2010
[90] Campaign to Protect Rural Essex public consultation response : February 2010
[91] Colne Stour Countryside Association public consultation response : February 2010

a new line would be contrary to Holford Rules against creating 'wirescape' (Holford Rule 6).

10.37 Suffolk Preservation Society's response[92] focused on alternatives to an overhead line between Bramford and Twinstead Tee, including use of underground cables. Its response set out an aspiration for underground cables to replace existing overhead lines to remove existing blight for communities such as Hintlesham.

10.38 The issues raised by statutory consultees and action groups also featured in representations from members of potentially affected communities. A summary of these representations is contained in the Stage 1 Feedback Report. Concerns raised by numbers of respondents included:

- effects on Dedham Vale AONB;
- effects on Special Landscape Areas;
- Corridors 3 and 4 would ruin the unspoilt countryside which is currently free from major intrusive infrastructure;
- Corridors 3 and 4 run across the grain of the landscape and across high ridges;
- Corridors 3 and 4 are less direct and so longer and would include greater numbers of the more prominent angle pylons where the line would change direction;
- intervisibility of Corridors 3 and 4 with the existing 132kV and 400kV lines;
- the cumulative effect of a new larger line next to the existing 400kV overhead line if Corridor 2 was used for a new line;
- the need for a more detailed landscape and visual impact assessment, sometimes also referring to the need for photomontage and visualisations;
- effects of a new overhead line on ancient landscape (separate from the setting of listed buildings or monuments considered under Archaeology and Cultural Heritage);

[92] Suffolk Preservation Society public consultation response : February 2010

- perceived conflict with the Holford Rules. This was stated in a number of representations, often with the same Rule being quoted as against, or in support of, different corridors.

10.39 There was a strong preference for undergrounding, with many respondents referring to the preference for the connection between Bramford and Twinstead Tee to be made in whole or in part by use of underground cables rather than by overhead line. Sections of the corridors where there have been greatest reference to benefits of undergrounding are the Dedham Vale AONB and the Stour Valley and their immediate settings. The Brett Valley to the south of Hadleigh and the area around Hintlesham have also been mentioned in a number of representations

Comparison of Impacts of Corridors

Route length and directness

10.40 A shorter length of proposed overhead line would typically be expected to give rise to fewer effects on the landscape and on views if other factors are broadly equal. Corridor 1 is the shortest proposed corridor (26km), followed by Corridor 3 (26.5km) and Corridor 2 (2A - 28.5km, 2B - 27km) with the longest being Corridor 4 (30km).

10.41 However the differences in these distances is not great (the greatest difference being approximately 4km) and consideration of the proposal as a whole is therefore required in the context of the local topography, the landscape character (including its capacity and sensitivity) and visual receptors.

10.42 Corridor 3 deviates to avoid settlements and Corridor 4 takes a less direct route between Bramford and Twinstead Tee so a new overhead line in these corridors may require more angle pylons than a line in Corridors 1 and 2. However Corridors 3 and 4 are up to 2km wide in places which will enable the detailed connection design studies to minimise the number of angle pylons required and to site them in appropriate locations to minimise the effects. This is not considered to be a determining factor in deciding between corridors.

Topography

10.43 The Route Corridor Study Report confirmed that the topography of the study area is a series of river valleys running approximately north-south whereas the connection between Bramford and Twinstead Tee needs to run east-west across the grain of the landscape. It is considered good practice (in accordance with Holford Rules 4 and 5) to use landform where possible to screen or background overhead lines and to avoid skylines and ridges. Due to the nature of the river patterns in relation to Bramford Substation and Twinstead Tee it was not possible to identify a corridor which utilises only the lower ground of the study area. These lower lying areas also include designated landscape and so would not be preferred in any case.

10.44 All corridor options have to cross the grain of the topography and landscape, crossing areas of higher ground. However these higher areas are broad plateaus rather than sharp ridges and the land continues to gradually rise to the north and northwest.

10.45 Table 10.1 below summarises the ground elevations each of the corridor options cross.

Table 10.1: Summary of Elevation

Corridor	Interfluves and Valleys						
	Stour Valley	Stour Box Interfluve	Box Valley	Box Brett Interfluve	Brett Valley	Brett Burstall Interfluve	Burstall Valley
1	<20m	60-70m	20m	60-70m	15m	55-60m	20m
2	<20m	60-70m	20m	60-70m	15m	55-60m	20m
3	>20m	60-70m	30m	60-70m	>20m	60-65m	30m
4	>20m	60-70m	50m	70-80m	30m	65-70m	40m

10.46 Table 10.1 shows that all 4 Corridors pass through each lower lying river valley and each of the higher intervening interfluves. Corridor 4 crosses the highest ground towards the north of the study area, however there is less difference between the valleys and the interfluves in this area which becomes increasingly pronounced towards the south of the study area in the vicinity of Corridors 1 and 2.

10.47 An overhead line at a higher elevation may result in views being possible over a wider area. The view of an overhead line running across relatively uniform land may however be less visually discordant than views of a line running across land with more undulations and changes in elevation. The location, orientation and number of visual receptors are important in determining the effects of topography, together with the localised benefit of woodland and hedgerow vegetation for filtering and backgrounding views. These local features will be considered in full at the detailed connection design stage. The highest peaks in the topography would also be avoided when siting overhead line pylons, where possible.

10.48 No corridor performs distinctively better than others with regard to respecting topography of the study area.

Landscape Character

10.49 Any connection between Bramford and Twinstead Tee will cross the grain of the landscape as discussed above. All corridors cross the River Stour, River Box, River Brett and Flowton/Belstead Brook together with the intervening 'interfluves'. The anticipated effects are subtly different depending where each corridor crosses these watercourses.

10.50 Each of the corridors identified has to cross the Stour Valley in the same area to the south of Sudbury. The location of the intended connection close to the Twinstead Tee, built development, woodland and the existing overhead lines all constrain where this crossing can be made. Corridors 1, 3 and 4 will require an additional overhead line crossing of the Stour Valley resulting in a total of three overhead lines whereas Corridor 2 will use the route corridor of the existing 132kV overhead line resulting in a total of two crossings.

10.51 Corridor 3 and to a greater extent Corridor 4 have sought to minimise effects on the Brett, Box and Flowton/Belstead valley landscapes by taking a more northerly alignment and crossing them at higher reaches where the characteristic lowland river valley landscape is less pronounced. The river valleys are identified as Special Landscape Areas and the effects on these designated areas are discussed in further detail below.

10.52 The size and scale of the landscape increases on the 'interfluve' areas where there are larger arable fields, often amalgamated in places, and with less undulation. Although this landscape is more open giving rise to longer distance views, this larger scale landscape potentially offers greater capacity to accommodate the scale of a 400kV overhead line. However it was noted during consultation that there is perceived to be high value in these areas of undesignated landscape and the landscape has 'ancient qualities' which have been untouched by modern development.

10.53 The 400kV and 132kV overhead lines are existing features in the landscape in the south of the study area (Corridors 1 and 2). Corridor 1 would lead to an additional 400kV overhead line adjacent these existing lines and Corridor 2 would lead to a scale of change from the existing situation. The existing 132kV line with standard pylon heights of approximately 26.5m would be replaced with new pylons approximately 50m high. There would be slightly fewer overhead line pylons (approximately 73 400kV pylons as compared to 92 132kV pylons assuming a similar route is adopted). Using either Corridor 3 or Corridor 4 would introduce an overhead line into an area where there are presently no overhead lines.

10.54 Statutory consultees, including affected planning authorities and Natural England, have clearly indicated preference for the scale of change associated with Corridor 2, albeit with a preference for at least some of the route to be installed using underground cables. It is noted that the Dedham Vale AONB and Stour Valley Partnership has stated its strong objection to any route with emphasis on protection of the AONB. Nonetheless, particular weight should be placed on the views of the planning authorities and Natural England.

Dedham Vale AONB

10.55 The existing 400kV and 132kV overhead lines pass through the AONB for a distance of approximately 3km. Corridors 1 and 2 have been identified as 'opportunity corridors' as they use the existing line routes which already pass through the AONB. Both corridors would have a direct effect on the AONB designated area.

10.56 Corridor 1 would result in an additional line in the AONB running parallel to two existing overhead lines (400kV and 132kV). This would increase the landscape and visual effects on the AONB.

10.57 Corridor 2 proposes using the route of the existing 132kV overhead line and would not result in any additional overhead lines in the landscape. The new line would have taller pylons (47m) compared to the existing 132kV line (26.5m), and bulkier conductors. The different pylon type required for the proposed overhead line compared to the pylons of the existing 400kV line reduces the prospect of very close synchronicity, although the new pylon design will be very similar to the type of pylons associated with the existing 400kV line. There would be a clearly perceptible scale of change in views in the AONB, however these effects would be concentrated into an area which already has overhead lines within views.

10.58 Corridor 3 avoids the AONB, however it runs within 1.25km of the AONB boundary in the vicinity of Boxford and there would be intervisibility from places in the AONB with views of the existing lines and a new line on Corridor 3. This would be an issue considered if identifying the alignment of a new line in Corridor 3, along with effects on more local views and constraints.

10.59 Corridor 4 avoids the AONB and has greater separation from it than Corridor 3, although it runs within 3km of the AONB boundary in the vicinity of Newton. The potential for effects on the designated landscape, and on views from within the AONB, is considered to be the least with Corridor 4. Minimising intervisibility would be a criterion used in designing an alignment in Corridor 4.

10.60 The corridor likely to have least effect on the AONB would be Corridor 4, due to its greater distance from the AONB. Corridor 3 would have the next lowest levels of effect, followed by, Corridor 2, and finally Corridor 1. Corridor 1 would have the greatest effect on the AONB as it would introduce an additional structure into the AONB as compared to Corridor 2's effective replacement of the 132kV overhead line with a new 400kV overhead line.

Special Landscape Areas

10.61 The value of the river valley landscapes outside of the nationally designated AONB is recognised in local landscape designations. The Dedham Vale AONB

extends along the River Stour. Special Landscape Area (SLA) designations extend from this along the Rivers Stour, Box, Brett and Flowton/Belstead Brook.

10.62 The extent to which the corridors under consideration pass through SLAs is illustrated in Table 10.2 below. (All lengths are approximate ranges based on indicative alignments in corridors.)

Table 10.2 Lengths of Corridors in Areas Designated for Landscape Value

Corridor	Lengths of Corridors in SLA and AONB				
	Stour Valley SLA	Box Valley SLA	Brett Valley SLA	Flowton/ Burstall Valley SLA	Total
1	6.5km	3km AONB	4.5km	4km	15km + 3km AONB
2	7km	3km AONB	4.5km	4km	15km + 3km AONB
3	5km	1-1.5km	4.5km	2.5km	13-13.5km
4	5km	0-2km	1.5-3.5km	0-1km	6.5-11.5km

10.63 All corridors pass through the Stour Valley SLA and this is unavoidable as it has been demonstrated that there is a need for a connection at Twinstead Tee. Similarly all corridors pass through the Brett Valley although Corridor 4 seeks to take the narrowest route through this valley. Avoidance of this SLA would require a corridor to be routed to the north of Lavenham which would make an excessively long route.

10.64 Corridors 1 and 2 run through the greatest lengths of SLA at around 15km with an additional 3km through AONB. Corridor 3 runs through around 13km of SLA and corridor 4 sought to minimise the length of the corridor within SLA where possible with a best case length of around 6.5km potentially increasing up to 11.5km depending on where the connection runs within the corridor. The existing overhead lines are features in the landscape to the south of the study area (Corridors 1 and 2) whereas Corridors 3 and 4 would introduce an overhead line into SLAs where there are presently no overhead lines.

10.65 Particular weight should again be placed on the views of the planning authorities and Natural England : that the scale of change from the existing situation by using Corridor 2 is preferable to introducing a new line into areas outside of, but close to and visible from, designated landscapes.

Historic Landscape Characterisation

10.66 In terms of historic landscape characterisation, there is little differentiation between the four corridors, all of which pass through a predominantly 'ancient landscape' with more recent influences to the west.

10.67 The main difference in terms of the historic landscape is that the existing 132kV and 400kV overhead lines are features which are present in the landscape in the south of the study area. Corridors 3 and 4 would introduce an overhead line into an area which is presently devoid of overhead lines, and Corridor 1 would introduce a new overhead line in an area where there are already 2 overhead lines.

10.68 The balance of views from the planning authorities and Natural England is that it is strongly preferable to introduce the scale of change in this landscape effected by adopting Corridor 2 rather than to introduce a new route into the wider 'ancient landscape'.

Proximity to Settlements and Conservation Areas

10.69 The corridors have sought to exclude all significant settlements and sites allocated for housing, maximising the distance between corridors and settlements where other constraints allow.

10.70 Corridors 1 and 2 propose to site the overhead line adjacent the existing overhead lines. The existing lines run close to several settlements including Burstall, Hintlesham and Chattisham, Hadleigh, Polstead Heath, Harrow Street, Assington, Workhouse Green, Lamarsh and Twinstead.

10.71 Corridor 3 runs close to Burstall Hill, Flowton and Aldham; between the settlements of Hadleigh and Kersey; Wicker Street Green, Boxford, Groton and Sherbourne Street; Newton, Little Cornard and Great Henny.

10.72 Corridor 4 runs close to Flowton, Naughton, Semer, Lindsey Tye, Chelsworth Common, Milden, Priory Green, Little Waldingfield, Great Waldingfield, Newton, Little Cornard and Great Henny.

10.73 The majority of settlements contain historic cores, many of which are designated as Conservation Areas, and some of these designations extend beyond the extent of the built form into the surrounding landscape. The effects on Conservation Areas are considered in Chapter 12, however the effect on the wider setting in relation to the south Suffolk landscape also requires consideration.

10.74 The older settlements are concentrated in the lower lying valley areas. This is particularly noticeable in the Brett valley where the A1141 runs along the valley linking Hadleigh, Semer, Chelsworth, Monks Eleigh, Brent Eleigh and Lavenham. The setting of these villages and settlements largely relates to the valley landscape, however the importance of the wider landscape has been raised in consultation as being important and untouched by time in the historic setting of these medieval wool villages.

10.75 The views from many of the villages to the higher adjacent ground are limited by buildings, landform, hedges and trees. There are some exceptions to this where villages are on higher ground or where the topography is less steep, where there are more open views.

10.76 Detailed consideration of the effect on the setting of the Conservation Areas and the effect on views from the settlements will be undertaken when identifying the detailed connection design within a corridor, as the effect has the potential to vary considerably due to the width of the corridor identified. For example an overhead line alignment to the western extent of Corridor 4 would have a greater effect on Great Waldingfield and Little Waldingfield than an alignment to the east which would be a further 2km from these settlements further enhanced by intervening topography and vegetation. This however would bring an overhead line closer to Priory Green and Edwardstone.

10.77 The issue of scale of change is again an important consideration. Villages such as Hintlesham, Chattisham and Twinstead already have overhead lines nearby and would be adversely affected by a new or "replacement" larger overhead line than the existing. Conversely, other villages presently relatively distant from an

overhead line would experience adverse effect from a new overhead line closer to them. However it is considered that there is little distinction between the corridors in respect of settings of settlements.

10.78 Scattered dwellings (including some Grade 2 Listed Buildings) are included within corridors where it is considered that sufficient separation between possible alignments and receptors can be achieved to avoid unacceptable adverse effects on amenity.

10.79 Alignments generally will seek to maximise the distance from properties. Corridors 1 and 2 offer less capacity to maximise distance from properties as the existing overhead lines will dictate the alignment of a new overhead line to a great extent. The existing overhead lines are however already present in the vicinity of these properties potentially giving rise to a lower scale of effect. Effects on views are discussed further in the paragraphs below.

10.80 Corridors 3 and 4 offer more capacity to maximise distances from properties although there are no overhead lines already present in these areas giving rise to a greater scale of change. Effects on views are discussed further in the paragraphs below.

Compliance with the Holford Rules

10.81 The Holford Rules are the guidelines National Grid uses for the routeing of new high voltage overhead lines. They are a valuable tool in identifying and assessing potential route options and the accompanying notes provide useful guidance particularly for where exceptions to the rules arise and how these should be best addressed. These rules have been taken into consideration in the routeing study. Table 10.3 below considers the corridors in relation to these rules.

Table 10.3: Corridors and Holford Rules

Corridor	1	2	3	4
Rule 1: Avoid areas of the highest Amenity Value	Additional line passes through AONB	Replacement line passes through AONB	Avoids AONB	Avoids AONB
Rule 2: Avoid smaller areas of amenity value	Direct effect on SSSI	Potential direct effect on SSSI	Avoids direct effects	Avoids direct effects
Rule 3: Choose most direct line	Most direct corridor	Direct corridor	Deviates to avoid settlements	Least direct corridor
Rule 4: Choose tree or hill backgrounds avoiding ridges	Crosses 3 'interfluves'	Crosses 3 'interfluves'	Crosses 3 'interfluves'	Crosses 3 'interfluves' (this option crosses highest ground)
Rule 5: Prefer moderately open valleys	Crosses 4 valleys	Crosses 4 valleys	Crosses 4 valleys	Crosses 4 valleys
Rule 6: Keep lines independent to avoid 'wirescape'	Will result in 3 closely paralleled lines with none removed.	Will result in 2 closely paralleled lines, with one lower height existing line removed.	2 closely paralleled lines would remain; one new line with some intervisiblity between lines at 2-3km.	2 closely paralleled lines would remain; over 6km separation reduces intervisibility between lines.

10.82 The summary table indicates that none of the corridors fully adhere to guidance expressed in the Holford Rules, requiring each corridor to be carefully considered in relation to each other to evaluate which is preferred in terms of its effect on landscape and views. It would not be anticipated that a proposal would be identified that would adhere fully to the Holford Rules, which is why the discussion and Supplementary Notes to the Rules address exceptions.

10.83 The central issue remains the relative scale of change in the landscape.

10.84 Table 10.3 demonstrates that Corridors 1 and 2 conflict with the Rules regarding avoiding areas of highest amenity value (AONB) and also effect on the Site of Special Scientific Interest at Hintlesham Woods. The table provides a summary and judgement needs to be applied with regard to the scale and nature of the effect that would arise in each case. The effect on the AONB arising from use of

Corridor 1 would be large, whereas using Corridor 2 would give rise to a lower scale of effect stemming from the 'replacement' of the 132kV line with a taller 400kV line.

10.85 Corridor 1 and option 2B of Corridor 2 would involve change to Hintlesham Woods where a greater area of scrub and coppice would be introduced by clearing woodland to allow a route for the new overhead line parallel to the existing. This is explained in Chapter 12 referring to the ecological interest of the woodlands.

Visual Assessment

10.86 Corridors 1 and 2 propose to closely parallel the existing 400kV overhead line corridor. Closely synchronised paralleling is generally preferred when running two overhead lines of similar voltage and size together. This high degree of synchronicity between the lines assists in minimising the overall visual effect of the two lines in parallel.

10.87 While there is scope to achieve synchronisation between the existing 400kV overhead line and a new line within Corridor 1, it would not be possible to achieve complete synchronicity for a number of reasons. The new line would use a different pylon design to the existing line, because the design used for the existing pylons cannot accommodate the type of conductors (wires) now required. There is a pylon design available which is similar to the existing design and the difference between the pylons on the existing 400kV line and the new pylons is not likely to be pronounced. Notwithstanding, the difference between the pylons in parallel has the potential to draw attention to, rather than minimise, the combined effect of the parallel lines. Additionally, the position of the existing line would make it very difficult for a second 400kV overhead line line to closely parallel and achieve appropriate distances from environmental constraints including woodland and properties. This would require diversions taking the second line to varying distances from the existing line which again may draw attention to the imperfect synchronicity in the alignments.

10.88 Corridor 1 would result in three entities with regular structures in the landscape: two 400kV overhead lines imperfectly paralleled and a generally adjacent 132kV overhead line. This would give rise to a substantial scale of change in many views including a cumulative effect.

10.89 Corridor 2 proposes to use part of the route of the existing 132kV overhead line, seeking to minimise the scale of change caused by the new 400kV line in the landscape by effectively replacing the 132kV overhead line.

10.90 The scales of the 400kV and 132kV pylons appear very differently in a variety of views:

- In close views when viewed with the 132kV line pylons nearest the viewer, both sets of pylons appear similar in scale;
- In close views when viewed with the 400kV line pylons nearest the viewer, the difference in heights between the pylons is more pronounced;
- In medium distance views, say at distances of around 1km, the difference in pylon heights is more pronounced and topography and vegetation have a notably greater effect in providing both screening and backgrounding for the 132kV line. Both the pylons and conductors are more visually prominent on the 400kV lines in these views, with the pylons appearing linked (in the case of 400kV) rather than as isolated structures (often in the case of 132kV at this distance where the conductors are not noticeable);
- In longer distance views, say at distances of over 2km and greater, the lower voltage 132kV line is not perceptible in some views with topography and vegetation very effective in providing both screening and backgrounding for the 132kV lines. Topography and vegetation play an important part in minimising the effect of higher voltage lines in the landscape, but require more marked variation in the landscape or greater distances between the viewer and the line as compared to similar effects on the smaller 132kV overhead line.

10.91 Corridor 2 would give rise to a lower scale of effect on landscape and views than Corridor 1, however building a new 400kV overhead line along the 132kV line route adjacent to the existing 400kV overhead line would still give rise to notable effects.

10.92 The zone over which Corridor 2 would be seen would be very similar to the area from which the existing 400kV and 132kV lines can be seen. The prominence of the overhead lines in the views would increase due to the scale of the structures, particularly in medium distance views, and it would lead to a change in views from some viewpoints within the AONB. The visual effects would

however be concentrated over a smaller geographic area than would arise if a new line were installed along Corridor 3 or Corridor 4.

10.93 Corridor 3 runs to the north of Hadleigh and would avoid an alignment running closely parallel to the existing lines. However, it runs 2-3km distant along its length, and, although topography, vegetation and built form would assist greatly in reducing the perception of proximity, there would likely be intervisibility between the existing and the new overhead line in places.

10.94 Corridor 4 runs further north up to 7km distant from the existing overhead lines. This distance and the intervening topography, vegetation and built form are likely to combine to play a greater role in minimising intervisibility for the majority of the route. The exception would be the inevitable concentrations of overhead lines at each of the connection points which are common to any corridor between them. Corridor 4 would introduce an overhead line into an area where no overhead lines are present, leading to a less concentrated effect over a larger area. There would be the least change in views from within the AONB for Corridor 4.

10.95 There is an extensive network of quiet lanes and public rights of way across the study area, including some longer distance routes such as the Stour Valley Path, and a number of cycle routes, including the Sustrans Hull-Harwich long distance cycle route and the South Suffolk cycle route. The proposed connection would affect views from the various recreational routes, though it is not possible to distinguish between the corridors on this basis.

10.96 Detailed visual impact assessment would be undertaken during the connection design stage and subsequent EIA of the preferred route alignment to ensure the visual effects of the proposed overhead line are fully considered and minimised where possible.

Iconic Views

10.97 During consultations, reference was made to 'iconic' views within the study area which need to be carefully considered. There is no definitive list of 'iconic views' and consultation representations referred to a large number of locally valued views, often containing focal points such as churches or other distinctive buildings. Because of this, there would not appear to be value in identifying a

definitive list of views to be considered as 'iconic' for south Suffolk and using these as specific criteria against which to assess corridors.

10.98 The existing overhead lines present in the vicinity of Corridors 1 and 2 mean that there is likely to be lower levels of effects from a new overhead line on valued views in this area given the scale of change from the existing situation, whereas Corridors 3 and 4 will give rise to a new overhead line in views where there are presently no overhead lines.

Conclusions

10.99 The corridors have been reviewed in relation to : effects on landscape and views; topography; landscape policy; published landscape character assessments; historic landscape character; and relevant responses to consultation. The following conclusions have been drawn.

10.100 It is clear, from a policy perspective, that where there are potential overhead line routes which avoid an AONB (in this case Corridors 3 and 4), these should be chosen in preference to those passing through it, unless there are other factors which weigh against this. However neither national nor local planning policies nor National Grid's own policies (the Holford Rules and its Commitments) preclude consideration of routes through an AONB. In terms of planning policy, National Grid has identified a clear need for the connection and alternatives have been evaluated, with statutory consultees concluding that Corridor 2 would be the least worst environmental option, subject to certain safeguards. Such safeguards are consistent with planning policy which seeks to minimise the impacts of development on the AONB. The existence of high voltage overhead lines crossing the AONB is a material consideration and one which has influenced the views of stakeholders and other respondents. Consultation representations, from the public and from other stakeholders including planning authorities and Natural England acknowledge this and express strong concern that an overhead line in the corridors outside the AONB would result in undesirable impact on an "unspoilt" landscape.

10.101 Corridor 1 would parallel the existing 400kV overhead line. Although it is the shortest option under consideration it would result in three overhead lines close to each other in the landscape, partly within the Dedham Vale AONB. There is general agreement, in consultation representations, that promoting an

additional overhead line through the AONB, which would be the case with Corridor 1, would be contrary to policy.

10.102 The AONB designation recognised the existence of parallel overhead lines at the time of designation and the adoption of Corridor 2 would not increase the number of pylons or lines passing through the AONB (however the new line's pylons would be larger than those of the existing 132kV overhead line it would replace). The different pylon type required for the proposed overhead line compared to the pylons of the existing line reduces the prospect of very close synchronicity, although there will be a new pylon design very similar to the existing type. There would be a clearly perceptible scale of change in views in the local area, including within the AONB, however these effects would be concentrated into an area which already has overhead lines within views.

10.103 The requirement to closely align with the existing overhead line to minimise visual effects, means that there may be less capacity to avoid occasional areas of vegetation and dwellings, which may be subject to a greater scale of effects than in a corridor with a greater width which offers greater flexibility in terms of the alignment options available.

10.104 Because of the removal of the existing 132kV overhead line, Corridor 2 also requires additional works to be undertaken to continue to supply the local distribution electricity network. This would require a new substation to the west of Twinstead Tee which will give rise to site specific effects on the landscape and in views. An initial study has identified three sites for a substation and in each case the effects on landscape and views are considered to be localised and of relatively small scale. The possible substation sites are adjacent to the existing overhead lines where these are close to each other and so the development will have some relationship with existing electrical infrastructure.

10.105 There will be few 'in combination' or cumulative effects arising from the new substation with the new 400kV overhead line. The requirement for a new substation does not have a strong influence on the overall preference between the corridors.

10.106 The current position of UKPN, which presently owns the 132kV line between Bramford and Twinstead Tee, is that it may have a requirement to retain the line west of Twinstead Tee. If part of this existing 132kV line was removed west

of the Tee, it would bring benefits to those that would experience its absence in views and could partly offset the scale of change that would arise around the Tee from the replacement of the 132kV line with the taller 400kV line. However the benefit that would arise is not very important to the consideration of the merit of Corridor 2. This potential benefit was rarely mentioned in representations supporting Corridor 2.

10.107 Corridor 2 does not avoid the AONB, as National Grid's guidance advises, and it would not 'conserve and enhance the natural beauty' of the AONB which is the purpose of its designation. However the presence of the existing 132kV and 400kV lines running through the AONB presents an opportunity to minimise the overall scale of change a new overhead line would bring.

10.108 The response from the consultation exercise has preferred the use of Corridor 2 if an overhead line between Bramford and Twinstead Tee is to be built. Subject to caveats relating to confirmation of need and consideration of undergrounding, local planning authorities and Natural England have stated their preference for Corridor 2 (see Chapter 9). National Grid attaches weight to their views as the agencies responsible for local planning and as statutory adviser on landscape respectively.

10.109 Corridor 3 offers a relatively direct route between Bramford and Twinstead Tee to the north of Hadleigh and it seeks to avoid the main environmental constraints including the AONB. However it passes close to the settlements of Boxford, Groton and Sherbourne Street and it runs approximately 2-3km distant from the existing lines giving rise to some intervisibility between lines. This option is less preferred in terms of its effect on the landscape and in views, compared to Corridor 4.

10.110 Corridor 4 takes a more northerly route between Bramford and Twinstead Tee and it is the longest route at 30km, however it presents the greatest separation from the AONB and the existing 132kV and 400kV line which minimises intervisibility. The visibility of the existing lines diminishes greatly at this level of separation. The corridor runs through a more open larger scale of landscape whose landscape character potentially offers greater capacity to accommodate the scale of a 400kV overhead line as compared to the more varied topography to the south, albeit that a new overhead line potentially would be more visible over a wider area.

10.111 Corridor 4 avoids the designated area of the AONB and runs through the smallest proportion of Special Landscape Area of all corridors under consideration; however it would be visible from adjacent Special Landscape Areas. It would also introduce a new overhead line into an area regarded by local authorities and residents as a high quality, albeit undesignated, 'ancient' landscape with medieval settlement patterns where there is presently no existing intrusive infrastructure.

10.112 National Grid's present guidance on the use of underground cables advises that AONBs are included within the category of 'exceptionally constrained areas' for which National Grid reserves detailed consideration of undergrounding. If consideration of possible alignments in a preferred corridor which passes through the Dedham Vale AONB resulted in a preference for undergrounding in the AONB, this would remove the direct effect of another overhead line in the AONB. There would however remain the risk of indirect adverse effects, including permanent loss of landscape features such as woodland, orchard, trees and hedgerows to a cables easement, together with the risk of adverse effects on archaeological and ecological resources from ground disturbance. The siting of the sealing end compound structures at either end of the cabled sections would require careful consideration as they would likely be close to the AONB boundary and could introduce adverse effects of the landscape.

11 HERITAGE

Introduction

11.1 This section of the report considers the potential effect of the different corridors on heritage assets and their settings.

Context

11.2 Within the focused study area surrounding the corridors, as defined in the Route Corridor Study, there are no World Heritage Sites or registered battlefields. There are however :

- 15 Scheduled Monuments which are primarily isolated moated sites or the remains of castles which are not interlinked;
- 1 Registered Park and Garden;

- 11 Conservation Areas which tend to be focused around town and village centres. Several Conservation Area boundaries extend to include an area beyond the settlement boundary, particularly at Monks Eleigh, Chelsworth and Hadleigh.;
- 34 Grade I, 53 Grade II* and 905 Grade II Listed Buildings and one Grade A listed church. These are predominantly contained within town and village centres. In particular there are clusters of historic buildings within the villages of Hadleigh, Kersey, Boxford, Sudbury, Monks Eleigh and Chelsworth. Beyond these settlements there are a number of listed buildings scattered throughout the area.

11.3 The Route Corridor Study explains how the corridors were identified seeking to avoid heritage assets. The corridors do not contain any Scheduled Monuments, Registered Parks and Gardens or Conservation Areas. It was not possible to avoid listed buildings in corridors. The numbers of listed buildings in each corridor (including options for Corridor 2) is presented in Table 11.1 below.

Table 11.1: Numbers of Listed Buildings in corridors

Corridor 1	Corridor 2A	Corridor 2B	Corridor 3	Corridor 4
20	19	17	27	40

11.4 Listed buildings and Conservation Areas are protected under the Planning (Listed Buildings and Conservation Areas) Act 1990 and this requires local planning authorities to have special regard to the desirability of preserving the setting of a listed building or conservation area. It also requires planning proposals to meet the test of determining the extent to which a development affects view to and from a Listed Building or Conservation Area. PPS5, Policy HE10 identifies that enhancing or protecting the setting of a heritage asset is a material consideration to the planning process. The benefits need to be weighed against the wider benefits of the development and the greater the negative impact, the greater the benefits will need to be to justify approval. Setting is defined in PPS5 as the surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve.

11.5 The degree to which any individual site is affected cannot be assessed accurately until such time as the detailed connection design, including the route

alignment and sites of new pylons, has been identified, however the data on known constraints will be used to influence it. The aim will be to minimise visual impacts on Conservation Areas and Listed Buildings and their settings, whichever corridor is selected. However the risk of harm to settings is a material factor in comparing corridors.

11.6 Individual consultation representations have included counts of the number of protected heritage assets within the proposed corridors, for example:

'Corridors 3 & 4 have in total 1361 listed buildings that would be blighted, against 941 in Corridors 1 & 2', and

'13 listed buildings, 4 conservation areas and 11 ancient scheduled monuments would be impacted wherever within corridor 4'.

11.7 It is not clear how these figures have been arrived at. The data presented at Table 11.1 above have been obtained from information downloaded from English Heritage. In any event, the numbers do not necessarily indicate the scale of effect that may arise. Corridors 1 and 2 are based on close paralleling to existing overhead lines whereas Corridors 3 and particularly Corridor 4 offer more flexibility for a connection to be aligned to avoid effects on heritage features.

11.8 The 'setting' of a Scheduled Monument is protected under the 1979 Ancient Monuments and Areas of Archaeological Importance Act. However, setting is not defined within the Act and is typically taken to refer to the immediate area around a protected site, for example the curtilage of a building or as stated in PPS5, the surroundings in which a heritage asset is experienced. English Heritage issued a consultation document in August 2010 on setting of historic features. This document echoes the Historic Environment Planning Practice Guide supporting PPS 5 that states that setting is the surroundings in which an asset is experienced, that views to or from an asset can play an important part in appreciating the asset and that other factors such as extensive (or multiple) heritage assets, landscape character, inter-visibility, designed views and changes over time can influence how sensitive the setting of an asset is to change.

11.9 Many Scheduled Monuments have a very limited or no above ground signature, and are not visited by the public. Many were never intended to have

prominence or dominance in the landscape in which they were built and were not built with deliberate vistas, sight lines or inter-visibility intended. Assuming that pylons and any other structures are sited to avoid the immediate area around any Scheduled Monument in the detailed design, such sites are not considered highly sensitive to visual impacts. In general, individual pylons will not cut off views in their entirety; in terms of scale, the development, particularly when viewed from a distance, will not be a significant detractor from the heritage asset.

11.10 Reference has been made to Historic Landscape Characterisation in identifying the corridors. This can be used to help site pylons and other structures, so that, where possible, these are positioned in less historically intact parts of the local landscape. It can also be used to indicate areas of greater or lesser potential for the survival of buried archaeological remains and of greater historic landscape character value, so that these areas can be taken into account when considering detailed connection design. Consequently, while the introduction of a new overhead line to a landscape with historic character and value is likely to be intrusive, mitigation has been achieved in part through the criteria used to identify the corridors and resolving the detailed connection design in the preferred corridor will seek the most sympathetic route possible.

11.11 The relative historic landscape character of the Study Area was considered when defining potential corridors and has been taken into account when making a comparison between corridors. However it offers little distinction between the corridors, other than to observe that the existing overhead lines are an existing detractor to otherwise old and intact land patterns.

Stage 1 Consultation Representations

11.12 English Heritage has commented[93] that "*the four route corridors identified in the Route Corridor Study pass through an area of south Suffolk, mainly in Babergh district that is extremely rich in designated historic assets sited within an historic landscape dominated by distinctive field patterns, enclosures, woodlands and the disposition of mediaeval villages, towns and farmsteads*." The Government's heritage adviser is particularly concerned that sufficient weight be given to the

[93] English Heritage public consultation response 15 March 2010

wider setting of heritage assets including, for example, important views and vistas into and out of Conservation Areas.

11.13 English Heritage recommended against selection of Corridor 1 on the grounds that the presence of three lines would cause further adverse impacts to the settings of listed buildings and conservation areas and views in and out of the latter, which are already to a large degree badly affected.

11.14 English Heritage considered that Corridor 2 would potentially cause the least damage to the settings of heritage assets, although it recommended that under grounding be thoroughly considered where the corridor crosses the Brett Valley immediately south of Hadleigh conservation area and within the Dedham Vale AONB between Polstead and Boxford.

11.15 English Heritage considered that new overhead lines anywhere within Corridors 3 or 4 would severely damage the settings of high grade listed buildings especially the landmark medieval churches. Similarly it considered that the Conservation Areas in the nearby villages would be adversely affected in terms of their settings, views in and out and their visual relationships with each other. It recommended that neither should be selected for further consideration.

11.16 The committee report to Suffolk County Council echoes this view noting that the landscapes of Corridors 3 and 4 " *have retained much of their historic pattern and many of their traditional features. These landscapes provide the setting to a number of historic small towns and villages such as Boxford, Groton, Kersey, Monks Eleigh, Semer, Chelsworth, Aldham and Whatfield, and create a series of iconic views for which the area is well known to residents and visitors*".

11.17 The Dedham Vale and Stour Valley AONB Partnership considered that an overhead line between Bramford and Twinstead Tee using any of the proposed corridors would conflict with planning policies which aim to protect the historic environment and expressed concern about the dominance of structures on the skyline over historic features, such as the setting of listed buildings and churches and the historic field patterns which form an integral part of the landscape character of the Dedham Vale AONB and Stour Valley.

11.18 The Suffolk Preservation Society commented that "*all of the proposed routes affect areas with a rich built heritage, containing many important listed*

buildings, including parish churches of national importance, farmsteads and cottages. In addition, all of the routes would directly affect the setting of conservation areas for which the area is famed".

11.19 In the public consultation representations and in representations from other statutory consultees (particularly the Parish Councils), there was general concern that any corridor could have a negative impact on the setting of a number of Listed Buildings, Conservation Areas, Scheduled Monuments and the historic landscape.

11.20 The Groton Pylon Alliance, representing 19 Parish Councils, considered that Corridors 3 and 4 contains more heritage assets which could be adversely affected and stressed the need to consider the conservation areas and listed buildings in their historic context, noting that the special nature of villages such as Kersey and Chelsworth "*stems from the unity of the wider surrounding landscape and its buildings*". The potential impact on a number of listed churches in these corridors was also noted.

11.21 Concerns were also raised in the Stage 1 Consultation about potential impacts on specific features, including Hintlesham Hall, Conservation Areas at Kersey, Naughton, Monks Eleigh and Lavenham and Flowton Church, as well as pockets of ancient woodland within the study area. Heritage features of this nature occur in and adjacent to each corridor. Impacts on them will be considered when resolving the detailed connection design stage.

Comparison of Impacts of Corridors

11.22 Corridor 1 passes close to the Conservation Areas of Hadleigh, Boxford and Polstead. A new overhead line in this corridor would be likely to be partially visible from these Conservation Areas. Although the existing overhead lines are already visible, a new additional line would bring further visual effects. However, micro-siting of pylons could effectively mitigate negative visual or physical effects on heritage assets. The corridor is also close to Hintlesham Hall and an area of Ancient Woodland. Concerns were raised about these sites in the consultation representations received, although mitigation of adverse impacts is possible with respect to both of these features.

11.23 As with all corridors, the construction of new pylon bases could impact on either known (non-scheduled) or currently unknown archaeological sites. However, a staged programme of archaeological assessment and localised flexibility to pylon siting can significantly and effectively mitigate any negative physical effects on heritage assets.

11.24 Corridor 1 is considered to be associated with a low risk of adverse effects with regard to archaeology and cultural heritage.

11.25 Corridor 2A passes close to Cobbler's Corner Moat Scheduled Monument (although no direct or indirect impacts are expected) and the Conservation Areas of Hadleigh, Boxford and Polstead. The line is likely to be partially visible from these Conservation Areas, although assessment and micro-siting of pylons could mitigate adverse impacts. Corridor 2B passes close to Hintlesham Hall and an area of Ancient Woodland, where as described for Corridor 1 above, concerns were raised. In the majority of cases, the scale of effects would be relatively low because of the effective replacement of the existing overhead line with a new line.

11.26 Both Corridors 2A and 2B are considered to be associated with a low risk of adverse effects with regard to archaeology and cultural heritage.

11.27 Corridor 3 passes close to the conservation areas at Hadleigh, Kersey and Boxford and Grade I and II* listed buildings at Aldham Hall and Groton. The line could be partially visible from these conservation areas and listed buildings, however detailed design, including selection of alignment within the corridor and mitigation including suitable off-site planting could help to mitigate adverse impacts. Consultation representations raised concerns over impacts on the setting of Kersey and Flowton Church. Impacts on both can be mitigated through assessment and sympathetic pylon siting, although Kersey Church is a highly visible landmark from well-used local roads, notably the Hadleigh bypass, and an overhead line on Corridor 3 would compromise views of this landmark.

11.28 This corridor comes close to the known multi-period settlement site to the north of Hadleigh, indicating a high potential for impacts on buried archaeological remains. However, a staged programme of archaeological assessment and localised flexibility to pylon siting could significantly and effectively mitigate any negative visual or physical effects on heritage assets. The high level of

knowledge of the archaeological interest of this area reflects successful mitigation which has been undertaken for other development.

11.29 Given the possibly greater requirement for heritage assessments and mitigation proposals, Corridor 3 is considered to be associated with a moderate risk of adverse effects with regard to archaeology and cultural heritage.

11.30 Corridor 4 passes close to the conservation areas at Naughton, Chelsworth, Monks Eleigh, Little Waldingfield and Great Waldingfield, also the Scheduled Monument moats at Elmsett, Milden and castle at Milden. There are also some discrete areas of Ancient Woodland within this corridor and consultation representations specifically raised concerns over potential visual impacts on Monks Eleigh, Flowton Church, Lavenham and Naughton. The line could be partially visible from some of these Conservation Areas and Scheduled Monuments. Corridor 4 is the widest of the corridors and so offers good scope for consideration of detailed design including sympathetic pylon siting to help to mitigate adverse impacts.

11.31 Given the possibly greater requirement for heritage assessments and mitigation proposals, Corridor 4 is considered to be associated with a moderate risk of adverse effects with regard to archaeology and cultural heritage.

Conclusions

11.32 None of the potential corridors carries any major archaeological or cultural heritage concerns, given that none pass directly through or over any protected sites. An overhead line in any of the corridors could avoid all of the statutory protected sites listed above.

11.33 All corridors carry a low to moderate risk of impacting on both known (non-protected) or unknown buried archaeological remains and all options could potentially have an in-direct (visual) impact in terms of views to and from local conservation areas and listed buildings. Corridor 3 crosses an area of demonstrable archaeological interest and there would be effects on landmark views from Hadleigh bypass and other roads to the distinctive Kersey Church.

11.34 The greatest number of specific concerns raised in the consultation representations related to Corridors 3 and 4. A number of representations

related to general concerns over the potential impacts on Listed Buildings, Conservation Areas, Scheduled Monuments and the Historic Landscape. Corridors 3 and 4 are considered to have greater risk of adverse effects on heritage assets. This is borne out by the clear position of English Heritage who recommended that neither corridor be pursued.

12 ECOLOGY/BIODIVERSITY

Introduction

12.1 This section of the report considers the effects of the corridors on the ecological resource, including sites designated for their ecological value.

Context

12.2 The study area is predominantly in arable agricultural use and the features of greatest ecological and biodiversity potential are the woodlands, many of which are ancient woodland, with some wetland habitats associated with watercourses.

12.3 There are no Ramsar sites, Special Protection Areas or Special Areas of Conservation in the study area. The highest areas of ecological constraint in the study areas are Sites of Special Scientific Interest (SSSI).

12.4 SSSIs are sites designated for their biodiversity or geological interest and are protected under the Wildlife and Countryside Act 1981[94] as amended by the Countryside and Rights of Way Act 2004[95]. They are protected from development and operations which are likely to damage their special interest and consultation with Natural England is required before consent can be granted for any development or operations likely to damage the SSSI interest.

12.5 National Grid's guidance advises that it should seek to avoid SSSIs when siting infrastructure and the Route Corridor Study sought to avoid these features when identifying corridors. Where avoidance is not possible, it is appropriate when

[94] Wildlife and Countryside Act 1981 c69
[95] Countryside and Rights of Way Act 2004 c37

investigating alignments within a corridor to consider in detail the effects of the overhead line on the interest of the SSSI.

12.6 There are several SSSIs interspersed throughout the study area and these predominantly comprise areas of woodland. They form the highest level of ecological constraint within the focused study area. A summary of the SSSIs within the study area for the Route Corridor Study follows below:

Table 12.1: Summary of SSSIs In Study Area

SSSI	Location / Grid Reference	Reason for Designation
Hintlesham Woods	North west of Hintlesham TM 055440	These woods are one of the largest remaining areas of ancient coppice-with-standards woodland in Suffolk. A variety of birds breed in these woods, encouraged by the recent resumption of coppicing in Wolves Wood. Species include Woodcock, Nightingale, Tawny Owl, Nuthatch and Whitethroat.
Arger Fen	North east of Bures TL 933357	Much of the site is woodland with areas of fen and grassland. The juxtaposition of several different habitats increases the value of the site for birds and insects. The steep sandy banks attract Badgers and there are a number of active setts within the site boundary.
Cornard Mere	South of Sudbury TL 888389	Cornard Mere comprises a seasonally flooded area of fen, species-rich ruderal herb vegetation, woodland, scrub and neutral grassland. Cornard Mere attracts considerable numbers of over-wintering snipe and provides a habitat for a variety of insects, including an uncommon sawfly.
Edwardstone Woods	North west of Edwardstone TL 935430	The Edwardstone Woods SSSI comprises an inter-related group of ancient woods (including Cowper's Wood, Park Wood and Stallington Wood) containing a diversity of stand types. These form a transition from mainly ash-maple-hazel woods of mid-Suffolk to the lime of south Suffolk.
Elmsett Park Woods	East of Elmsett TM 065465	A very wide range of woodland types are present and with an equally diverse ground flora the site is considered to be one of the richest small woods in Suffolk.
Milden Thicks	North of Edwardstone TL 942452	This group of woods (including Long Wood, Hazel Wood, Hall Wood, and Bulls Cross Wood) are of ecological and historical interest as individual woods. As a group they are of national importance for the comparison that can be made between them, especially in explaining the ecological behaviour of trees and the distribution of tree communities.

12.7 Locally designated sites are features on which National Grid seeks to minimise effects. These are numerous County Wildlife Sites present in the study area and although these sites have not been taken into consideration in identifying corridors, they will be considered in detail in defining the connection design. It

is considered that the detailed connection design, in particular the siting of pylons, in any of the four corridors will be able to ensure that such sites are protected or that other mitigation can adequately offset adverse effects. It is not therefore an issue which can be used to differentiate between corridors.

12.8 Holford Rules 4 and 5 refer to woodlands and their value in providing background to views and advice to avoid cutting extensive swathes through woodland blocks where possible.

12.9 Any form of woodland generally has landscape value whereas ecological value can vary greatly between different types of woodland. Woodland with relatively low ecological value may perform the same screening or backgrounding function in the landscape as one with very high ecological value. However ancient woodland is an irreplaceable nature conservation asset. Much ancient woodland is SSSI and is protected by that designation.

12.10 There are numerous woodlands interspersed throughout the study area and these tend to be present in discrete blocks rather than large swathes. The identification of corridors sought to avoid woodland as far as possible. Ancient woodland will be identified separately from other woodland in the preferred corridor, so that if options for the detailed route within the preferred corridor include woodland that cannot be avoided, a distinction can be made between ancient and other woodland.

Stage 1 Consultation Representations

12.11 In its consultation response, Natural England commented that "*several ancient woodland SSSIs are present in the study area and are intersected by route corridors 2B and 4 in particular. Option 2B intersects Hintlesham Woods SSSI. We consider that an additional line in this area may have an adverse impact on the SSSI. We therefore recommend that further detailed consideration is given to the route corridor Options 2A and 2B and that both options are included in the Environmental Impact Assessment if Option 2 is selected. There may be impacts on County Wildlife Sites and protected species. These will need to be considered at Environmental Impact Assessment stage*." Natural England concluded that Option 2 would have the least impact on the environment.

12.12 Both Natural England and the Suffolk Wildlife Trust[96] considered that County Wildlife Sites should have been included in the list of constraints when the Route Corridor Studies were undertaken. As noted above, National Grid considers that their importance in the local context must be acknowledged and their influence will become more significant at the detailed connection design stage, once decisions are being taken on possible route alignments and pylon positions. These sites have been considered in the selection of preferred corridor.

12.13 Suffolk Wildlife Trust considers that the least damaging route is Corridor 2, noting that Corridor 2A also avoids impacts on Hintlesham Woods SSSI.

12.14 Parish Councils in particular were concerned about the potential impacts of the corridors on SSSI, County Wildlife Sites and other sites of nature conservation interests, as well as impacts on specific species. These comments have been considered in the assessment of corridor preference, although these are generally issues which will be addressed in detail during the connection design stage and the environmental impact assessment. The detailed conection design would be identified to seek to avoid sites of particular interest.

Comparison of Impacts of Corridors

12.15 There are no sites of international or European nature conservation value (SPAs, SACs, Ramsar Sites) or National Nature Reserves close to or directly affected by any of the corridors. No potential for indirect effects on international or European sites has been identified.

12.16 The SSSIs in the study area comprise small discrete unlinked areas, often comprising woodland. SSSIs have been avoided in the identification of corridors, or where they are included within corridors there is certainty they can be avoided at the detailed connection design stage. The exception to this is Hintlesham Woods, in Corridor 1 and 2B, as the existing 400kV overhead line already crosses this woodland. The Hintlesham Woods SSSI designation covers Hintlesham Wood, Ramsey Wood and Wolves Wood and they also form part of an RSPB reserve as the area of coppiced woodland is valuable for several species of bird.

[96] Suffolk Wildlife Trust public consultation response : February 2010

12.17 Corridors 1 and 2B could potentially result in direct effects on this SSSI subject to the detailed connection design studies as the existing 400kV overhead line to which these options would seek to run parallel passes through this woodland. The specific interest of the Hintlesham Woods site is in its vegetation communities, including trees and some flora which rely upon coppicing. The introduction of coppice woodland in one part of the designation (Wolves Wood) is noted in the site's citation as having encouraged a number of breeding bird species. Establishing a wider coppiced 'ride' in the woodland to allow a new overhead line may be able to be implemented without causing severe adverse effect to the SSSI. Corridors 2A, 3 and 4 avoid direct effects on this SSSI.

12.18 Locally designated sites will be considered in detail in defining alignments. Corridors 1 and 2 require close alignment with the existing overhead line and will have effects on several County Wildlife Sites which are close to the existing lines. The scale of the effects will be dependent on the final alignment and the nature conservation interest of the site, although these will be sought to be minimised. In identifying alignments, the width of Corridors 3 and 4 offers greater scope to avoid existing sites.

12.19 Corridors 1 and 2 require close alignment with the existing overhead line to minimise visual effects, meaning that there may be less capacity to avoid occasional areas of woodland, some of which may be ancient woodland. The possible effect on Hintlesham Wood is discussed above. Corridors 3 and 4 offer greater scope to avoid existing woodlands in identifying alignments given the width of these corridors.

12.20 Representations from the public referred to potential effects on species such as birds, bats, newts, deer, badgers and other animals from a new overhead line in the identified corridors. The ornithological report[97] concluded that there is very low risk of significant adverse effects on birds from a new overhead line in any corridor. The overall risk to other species are similarly considered to be very low. There are existing overhead lines in the study area and the species about which concern was expressed co-exist with these lines. There is potential for adverse effects to arise during construction, particularly disturbance and limited habitat loss, but these are temporary and short-term effects for which mitigation

[97] TEP : Bramford to Twinstead Tee Connection: Route Corridors Ornithological Assessment 2009-2011 (Report Ref 1980.087)

can be readily identified. Risk of adverse effects on species is not a matter which affects the identification of the preferred corridor.

Conclusions

12.21 The corridors have been reviewed in relation to their potential effects on designated ecological sites. Consideration has also been given to the numerous consultation representations raised in relation to the potential effect on the ecological resource. The following conclusions have been drawn.

12.22 Corridors 1 and 2B would result in direct effects on Hintlesham Woods SSSI as the existing 400kV overhead line to which these options would seek to parallel runs through this woodland. Detailed connection design studies would seek to avoid or minimise this effect. Corridor 2A would avoid direct effects on Hintlesham Woods SSSI.

12.23 Corridors 1 and 2 require close alignment with the existing overhead lines which run in close proximity to or over areas of woodland and sites of local ecological value. There will be less scope to avoid these areas as compared to Corridors 3 and 4, however detailed connection design will seek to minimise the effects where possible. The majority of effects that would arise from use of Corridor 2 are similar to those that exist from the 132kV overhead line whose approximate route would be used for the new 400kV overhead line.

12.24 Corridors 3 and 4 offer the greatest scope to identify alignments to avoid designated sites and other areas of ecological value. There has been concern raised during consultation that these corridors will lead to effects on Milden Thicks and Edwardstone Woods SSSIs, however there is confidence that a detailed connection design would identify alignments which avoid these SSSIs.

12.25 National Grid gives weight to the preference expressed by Natural England and Suffolk Wildlife Trust for Corridor 2. However Corridors 3 and 4 offer greatest potential to minimise effects on biodiversity. In the case of Corridor 2, the majority of the nature conservation interest that would be affected is already affected to some degree by the existing 132kV overhead line which would be removed and replaced by the new overhead line. There would be opportunities to site pylons and route the line to minimise effects on nature conservation interest. Corridor 2 is preferred to a greater extent than Corridor 1 where the

line would give rise to new effects in a more constrained corridor than Corridors 3 or 4.

13 LAND USE AND SOCIO-ECONOMIC FACTORS

Introduction

13.1 This chapter considers the potential effects of the corridors on land use and socio-economic factors in the study area. In accordance with the overarching Policy Statement on Energy before Parliament for approval, this includes consideration of potential effects on open space, green infrastructure and Green Belt. Agriculture and mineral extraction are important uses in the study area which is predominantly rural.

Context

Agriculture

13.2 The Agricultural Land Classification (ALC) provides information on agricultural land and its quality. There are five classifications of agricultural land (six with a subsequent subdivision of Grade 3) with Grade 1, 2 and 3A land defined as "best and most versatile". Much of the land to the north of Hadleigh and the A1071, and the low-lying land in the river valleys is classified as Grade 3 under the Agricultural Land Classification. The higher ground, particularly to the south of A1071, is mainly classified as Grade 2 land. PPS7: Sustainable Development in Rural Areas[98] advocates that lower quality agricultural land is used for development before "best and most versatile" areas. Much of the land is in arable crop production, with areas of grazing land in the river valleys. There are large areas of orchard, particularly in the south west of the study area.

[98] DCLG : Planning Policy Statement 7 : Sustainable Development in Rural Areas : August 2004

Mineral Sites

13.3 There are four minerals sites within the study area designated as current or proposed sand and gravel working sites in the Suffolk Minerals Local Plan[99]. They include an 8.8 hectare site to the north of Hadleigh at Peyton Hall Farm; a 41 hectare site to the south west of Great Waldingfield; a 28 hectare extension to the existing 68.5 hectare site at Popes Green Farm to the south west of Hadleigh, between Polstead and Layham, adjacent to the existing 400kV and 132kV overhead lines; and a 9 hectare site to the north west of Edwardstone which has mineral consent for extraction until 2042.

Development planning policy

13.4 The current local planning policies steer growth towards the main settlements of Hadleigh, Sudbury and the Ipswich urban fringe. Most of the future housing and employment growth is likely to take place in, or on the edge of, these settlements. There are four development plan allocations for housing and open space within the study area. They are located to the south and south east of Sudbury, to the north east of Hadleigh and to the north of Whatfield.

13.5 Smaller scale development will be directed to sites within the built up areas of certain key service centres such as Bramford, Boxford and Bures. Elsewhere the development plan policies are generally restrictive, with little scope for development taking place outside existing settlements.

Airfields

13.6 There are a number of airfields and airstrips within the study area, which are considered further in Chapter 15.

Built Development

13.7 The main settlements within the study area are the towns of Hadleigh and Sudbury. Hadleigh is a small market town located approximately 7km to the south west of Bramford Substation and to the east of the River Brett. The town has a historic core with numerous listed buildings and a Conservation Area, with modern expansion including new housing and light industrial developments on

[99] Suffolk County Council : Suffolk Minerals Local Plan : May 1999

the perimeter of the town, particularly noticeable to the north. Sudbury is a larger market town, centred around a historic core at Market Hill. It is in the western extent of the study area adjacent the River Stour

13.8 There are numerous other villages dispersed throughout the area, the larger of which are located along the classified roads, with smaller villages and hamlets linked by the minor road system. The river valleys support most of the transport corridors and subsequently settlements within the area. There are many scattered dwellings typically along the network of narrow lanes throughout the study area.

Open space and green infrastructure

13.9 The development plans covering the study area identify areas of land which are to be protected or developed for open space and green infrastructure purposes, including strategic and structural open space and uses such as playing fields and allotments. These areas tend to be within the built up areas of the larger settlements or on the edge of settlements. As such they will not influence corridor selection. Furthermore, in defining the detailed connection design, pylons and overhead lines can be sited to avoid important areas of open space and green infrastructure.

Green Belt

13.10 None of the study area is designated as Green Belt in local Development Plans.

Tourism

13.11 The South Suffolk area is a destination for tourists who are attracted by its characteristic villages, landscape and heritage and by the associations with internationally renowned artists Thomas Gainsborough (Sudbury) and John Constable (Dedham Vale). A number of walking and cycle trails pass through the area and the tourism industry supports a large number of small businesses, mainly providing catering and accommodation. Tourism facilities and businesses tend to be located within the villages and larger settlements, with particular concentrations in the main towns of Hadleigh and Sudbury. Hintlesham Hall Hotel and golf course occupy an extensive area of land in the east of the study area.

Deprivation

13.12 In general, the study area is relatively affluent. It is not considered that an assessment of pockets of deprivation that may exist would assist in the selection of the preferred corridor.

Stage 1 Consultation Representations

13.13 The National Farmers Union expressed[100] concerns at the potential impact of both undergrounding and overhead line construction on agricultural operations but this would apply to all of the corridors.

13.14 A number of Parish Councils were also concerned about the potential impact on future flexibility of land use and on the scope for rural diversification.

13.15 There were also concerns about potential effects on the local economy which is dependant to some degree on tourists visiting the area. It was considered that the proposal would degrade and blight the landscape and views, thus affecting the cultural, historic and natural local environment which attracts tourists. In turn this could have a negative effect on local businesses dependant on tourism, which include pubs, self-catering accommodation, and Bed and Breakfast establishments.

Comparison of Impacts of Corridors

Agriculture

13.16 Overhead line construction causes temporary disturbance to land and can temporarily restrict access to other areas depending on working areas required. The footprints of overhead line pylons affect agricultural operations by introducing an obstacle to machinery. Operations such as water jet irrigation or use of very high vehicles and attachments are restricted beneath conductors to ensure that safety clearances are maintained. These restrictions apply equally across all corridors and landowners are compensated for temporary disturbance during construction and for the presence of the infrastructure on their land.

[100] National Farmers Union public consultation response : February 2010

13.17 Construction of an overhead line may give rise to longer-term effects on some land uses where the direct effect otherwise appears to be low. For pasture and annually cropped areas, the disturbance caused is typically limited to the time during which access is required, which may affect that year's crop in the case of annual crops. Orchards are typically planted in blocks and the economy and efficiency of operation relies on a consistent layout of trees and working areas. Although a pylon footprint may cause relatively low levels of disturbance to land use, gaining access to areas of an orchard could mean that this land use is greatly disturbed because it would not be possible to replant trees to the same maturity as those removed within the larger block. The ongoing effect on the orchard may endure until the next programmed re-planting. Corridors 1 and 2 include part of the Boxford Suffolk Fruit Farm orchards south east of Sudbury.

13.18 A longer route (Corridor 4 being the longest) would be anticipated to have greater effects on land use than a shorter route, although this can vary with numbers and types of pylons used and field pattern which influences how pylon positions can be accommodated to minimise constraints. Corridors 1 and 2 are more likely to affect Grade 2 agricultural land.

13.19 In considering undergrounding, temporary effects on agricultural operations will be taken into account including those of a wide and continuous working swathe. Permanent effects may also be possible, for example the effects described for overhead lines through orchards in Corridors 1 and 2 would be more pronounced with underground cables and the enduring restrictions on planting would introduce additional permanent effects.

Mineral sites

13.20 Four mineral sites have been identified within the study area. Corridors 1 and 2 run through the site at Popes Green Farm to the east of Polstead Heath adjacent to the existing overhead lines. It is understood that this section has been worked and restored and detailed connection design would seek wherever possible to minimise the effect on this site.

13.21 Corridors 3 and 4 run close to known mineral sites, however there is potential for alignments to be identified which avoid these areas.

13.22 Minerals planning policies aim to safeguard mineral workings but do allow for minerals to be worked in advance of other development, hence the presence of unworked deposits within a particular corridor should not prevent the consideration of that corridor, even if there is no potential for routes to avoid the areas of these deposits.

Built development

13.23 National Grid's guidance states that overhead line routes should avoid residential areas and that developed areas should be treated as areas of exceptional constraint. The identification of corridors therefore sought to avoid areas where there are groups of residential properties with only small gaps between them. Corridor 4 passes through the least populated part of the study area, while the other corridors pass close to the edge of the main town of Hadleigh.

13.24 Corridors 3 and 4 are sufficiently wide to allow a significant degree of flexibility in line routeing. This reduces the risk of unacceptable impacts on existing land uses. In Corridors 1 and 2 however, the need to achieve close paralleling between the existing and proposed overhead lines might make it more difficult to avoid productive land uses when siting pylons and access tracks.

Development planning policy

13.25 The generally restrictive policies governing development outside existing settlements means that there is only limited scope for a proposed connection in any of the corridors to impact directly on proposed development land.

Open space and green infrastructure

13.26 Green infrastructure refers to linked elements of multi-functional open space and aspects of natural environment. Where such elements are within, or on the edge of settlements they will not influence corridor selection because the corridors have been defined to avoid such areas. Overhead lines do not generally interfere with the function or purpose of other open spaces and in defining the detailed connection design, pylons and overhead lines can be sited to avoid important areas of open space where their presence would affect important functions.

Tourism

13.27 As most tourism businesses lie within settlements, the effect of a proposed connection in any corridor would be limited. There is no reliable method of assessing the wider impact of an overhead line on visitor numbers.

13.28 It is recognised that landscape and scenic qualities are part of the attraction of some tourist destinations and that any new development could have an effect on these qualities - such effects are considered in Chapter 10. However there are many kilometres of overhead lines in National Parks and AONBs which are designated for their landscape and scenic qualities and which attract large numbers of tourists. There are already overhead lines crossing the Dedham Vale AONB (including a 132kV overhead line close to the major tourist attraction at Flatford Mill) , so it is not necessarily the case that overhead lines and areas attractive to tourists are mutually incompatible.

13.29 At this stage, it is not possible to assess the extent of the wider impact of an overhead line on visitor numbers or any related footfall impacts businesses may experience. For many businesses, the visibility of an overhead line may not generate direct impacts. While it may be argued that the potential effects on perceptions of the wider area and visitor attitudes toward it need to be considered, there is no direct evidence, that overhead lines elsewhere have had a clearly negative impact on visitors' attitudes or have led to a reduction in visitor numbers to a particular area.

13.30 Care will be taken in identifying the detailed connection design to minimise adverse effects on those features which are valued for tourism. However there is no material distinction identified between the corridors with regard to possible effects on tourism.

Cumulative Impacts

13.31 Cumulative impacts may arise when, for example, one major development is to be progressed in close proximity to another or which could affect the same general area to a similar programme; where the impacts of developments may individually be insignificant but which could combine to produce a significant impact; or where a development may have a number of different impacts which could, when considered together, be deemed to be significant.

13.32 National Grid is aware of a proposal by East Anglia Offshore Wind Ltd which may include an on-shore converter station at or near Bramford substation to connect its proposed wind farm to the national transmission system. Details are not yet available and will be subject to further consultation and review. Until such time as more information is available, it is difficult to determine how individual receptors may be impacted by both projects. At this stage therefore, cumulative impacts associated with the presence of other projects cannot be used to differentiate corridors in the Bramford to Twinstead Tee case.

Conclusions

13.33 The assessment has shown that it is difficult to determine the effect of the scheme on local social and economic conditions until a detailed connection design has been prepared. It is not clear that there is any material distinction between the corridors and potential effects. The presence of the orchards south of Sudbury, which are important to the local economy and which may be directly affected by a new connection, is important to consider. However it is likely that measures can be taken in construction or detailed connection design to reduce these effects to acceptable levels.

13.34 Tourism businesses or activities in Corridors 1 and 2 already co-exist with the existing overhead lines. However these existing lines are often visible from Corridors 3 and 4 and the relationships between locations of tourism businesses and places tourists value is not known. It is not possible to distinguish clearly between the corridors on the basis of possible effects on tourism.

13.35 The corridors have been reviewed in relation to existing land use and consideration has also been given to the consultation representations raised in relation to the potential effect on land use. No significant effects on existing or future land uses have been identified for any of the corridors. Greater risk of impacting on existing land uses would be associated with Corridors 1 and 2, because of the narrower corridor width and more limited flexibility in pylon positioning.

13.36 It is considered that there is little distinction between the corridors in terms of potential impact on agricultural land use.

13.37 The corridors have sought to avoid mineral reserves and active sites. Where these are included within corridors there is sufficient certainty that these can be avoided at the detailed connection design stage.

14 ENGINEERING - BUILDABILITY/DELIVERABILITY

Introduction

14.1 This section of the report considers the relative deliverability of the route corridors. The Review of Strategic Options Report considered that a new connection between Bramford and Twinstead Tee is capable of being delivered in accordance with contractual obligations and projected demands for future connections.

Context

14.2 The construction of a new overhead line can be broken down into a number of phases:

- Detailed surveys;
- Pylon siting and design;
- Access and accommodation works;
- Pylon foundations;
- Pylon erection;
- Installation of conductors.

14.3 It is anticipated that construction of an overhead line along any of the corridors should take about two years, subject to the availability of outages required to connect the works to the transmission system.

Stage 1 Consultation Representations

14.4 Representations indicated some general concern about potential disturbance to local residents during the construction phase. Respondents questioned how much disruption would be caused to the road network in each corridor and

whether the small roads in this area would need to be upgraded during construction. Access for maintenance was also raised as an issue. The existing high voltage electricity transmission network includes infrastructure in many relatively remote and isolated areas. National Grid is familiar with the requirements of overhead line construction in a variety of different settings and, as part of the detailed connection design, will plan its construction activities and access arrangements such that they minimise the potential for environmental effects and disturbance to local residents and visitors.

Comparison of Impacts of Corridors

Engineering

14.5 The corridors can be compared against the following criteria which can affect project delivery:

- geotechnical issues;
- access for construction;
- presence of other utilities;
- requirements for motorway and rail crossings.

14.6 Geotechnical conditions will determine the locations for pylons and their foundation designs. There is little variation in geotechnical conditions across the study area which consists broadly of clay uplands and alluvial river valleys. There is sufficient flexibility in pylon locations in each corridor to account for localised conditions and there is no indication that geotechnical conditions on any of the corridors would act as a constraint on the engineering of the Bramford to Twinstead Tee connection. Hence this is not a consideration in selecting a corridor.

14.7 Construction activity benefits if there is good access to the principal highway network, as this makes delivery of materials much easier. It reduces the scope for congestion and damage to substandard local roads. It also reduces the potential impact of construction traffic on local residents. At the local level consideration also needs to be given to the potential extent of temporary road construction which may be needed and any other constraints on access, such as river crossings.

14.8 Corridor 3 has advantages from an access point of view because it runs close to A1071 for much of its length. However the extensive network of lanes across the study area means that in practice there is little to differentiate between the corridors. The presence of overhead lines on Corridors 1 and 2 means that access issues have been overcome in the past and it may be possible to take advantage of existing access rights or established arrangements with existing grantors to reach potential pylon construction sites should one of these options be selected.

14.9 Corridor 2 would require the construction of a new substation west of Twinstead Tee. This would have to be accessible for the abnormal indivisible loads associated with the transformers. An independent study by contractors Wynns[101] has established that the three potential sites would all be accessible.

14.10 The location of the main construction compounds has not been determined but is likely to be in one of the main centres of Sudbury, Hadleigh or Ipswich. Other subsidiary compounds would be needed along the route. Corridor 4 would be least accessible from the named centres, although this is not an issue that would weigh against selecting that corridor.

14.11 It is anticipated that there would be no material difference between corridors with regard to the environmental effects of construction access. The presence of the existing lines along Corridors 1 and 2 means that issues are likely to have been addressed satisfactorily for these corridors but there are no reasons to consider that unacceptable environmental effects would arise for the similar terrain and countryside of Corridors 3 and 4.

14.12 There is insufficient differentiation between the route corridors in relation to construction access for this to be a consideration in selecting a corridor.

Third party works

14.13 The potential impact of the scheme on third parties (in this case the Distribution Network Operator UKPN) and the need to provide ancillary works to deal with such impact could involve cost, programme, engineering and environmental

[101] Wynns : AIL access study : September 2009

issues. As these factors could affect the statutory obligations relating to the transmission and supply of electricity, they must be considered material. The involvement of third parties may also provide the opportunity for more optimal development of both transmission and distribution systems and this also needs to be taken into account. The presence of other utilities such as low voltage overhead lines and underground pipelines can be accommodated at the detailed connection design stage for any corridor and would not be a constraint on corridor selection.

14.14 The distribution network operator UKPN owns and operates a number of 132kV overhead lines in the study area. These include :

- a line between Burstall Bridge and Pelham via Twinstead Tee, connected to Bramford substation by a cabled section between Burstall Bridge and Bramford;
- two lines running south east from Bramford substation towards Cliff Quay,Ipswich and Lawford/Colchester;
- three lines approaching Bramford substation from the north and east, with approximately the final kilometre cabled in each case.

14.15 In addition there are a number of lower voltage lines in the Sudbury area, which would not pose a constraint to routeing a 400kV overhead line.

14.16 Corridor 1 would have no interface with the UKPN high voltage infrastructure and no ancillary works would be required.

14.17 If Corridor 2 were adopted, the 132kV line between Burstall Bridge and Twinstead Tee would have to be dismantled. If the 132kV line is removed, UKPN has indicated that there would be insufficient Supergrid Transformer capacity in the Wymondley/Pelham Group to comply with the standards for security of supply. Replacement provision would need to be made. In discussions with National Grid, UKPN has indicated that its preference would be to establish a new Grid Supply Point to the west of Twinstead Tee. National Grid has undertaken some preliminary siting studies for such a Supply Point (substation), with three potential sites being identified:

- Butlers Wood, east of Wickham St Paul;
- Delvyn's Lane, north east of Castle Hedingham;

- Colne Valley Farm Park, Castle Hedingham.

14.18 Should Corridor 2 be selected as the preferred corridor, detailed environmental impact assessment of each of these sites and local consultation would be undertaken to determine which one should be included in the Development Consent Order application.

14.19 UKPN has so far indicated that it may have a requirement to retain the section of 132kV overhead line between the connection point for the new Grid Supply Point and Twinstead Tee in order to retain flexibility in planning its own future network reinforcements.

14.20 At the eastern end of the corridor, the adoption of Corridor 2B would result in the removal of all overhead line infrastructure to the south of Hintlesham, over a distance of approximately 4km.

14.21 Given the need to maintain local electricity supplies, the adoption of Corridor 2 would introduce programming constraints in that the new Grid Supply Point would have to be built and commissioned before work could commence on dismantling the 132kV line between Burstall Bridge and Twinstead Tee, unless alternative temporary arrangements to maintain the security of supply could be agreed with UKPN. However the impact of these works on the operation of two networks (National Grid and UKPN), in terms of outages and interaction, can be managed within the available timescales.

14.22 Corridor 3 would have no interface with the UKPN high voltage infrastructure and no ancillary works would be required.

14.23 Corridor 4 would have no interface with the UKPN high voltage infrastructure and no ancillary works would be required, unless that part of the corridor to the north of Flowton were to be preferred. In that event, further studies would be required to determine how the relationship with the 132kV line which runs north west from Bramford substation should be managed.

14.24 For Corridor 2, there would be a need to construct a new substation, then take down the existing 132kV overhead line, before constructing a 400kV overhead line, but this can be accommodated within the overall development programme.

14.25 There are no motorways in the study area and only one rail crossing would be required. All of the corridors would cross the Sudbury branch railway at approximately right angles which would be the optimum arrangement.

14.26 No other significant potential risks to construction have been identified for any of the corridors.

14.27 The Route Corridor Study defined potential corridors on the basis that, within each corridor, it would be possible to define at least one viable route alignment taking into account the proposed specification of the connection (double circuit 400kV overhead line with triple Araucaria conductors per phase, supported by lattice steel pylons) and appropriate clearances for 400kV operation.

14.28 Should undergrounding be considered as part of the connection solution, this should be capable of being delivered within the programme so that the contractual obligations are met, provided that the undergrounding works are not extensive and can be carried out in parallel with other activities.

Conclusions

14.29 While each presents different challenges from a construction point of view, an overhead line can be built in any of the corridors and there is no significant difference between the corridors in terms of the main construction constraints or risk.

15 AVIATION/DEFENCE INTERESTS

Introduction

15.1 The overarching NPS for energy before Parliament for approval notes that "*UK airspace is important for both civilian and military aviation interests. It is essential that the safety of UK aerodromes, aircraft and airspace is not adversely affected by new energy infrastructure*".

Context

15.2 Certain civil aerodromes, and aviation technical sites, selected on the basis of their importance to the national air transport system, are officially safeguarded in order to ensure that their operation is not inhibited by new development. A

similar official safeguarding system applies to certain military aerodromes and defence assets, selected on the basis of their strategic importance.

15.3 There are a number of aviation facilities in the northern part of the study area, including : Elmsett Aerodrome, two airstrips near the village of Milden and Monks Eleigh, an airstrip at Newton and an additional airstrip at Hadleigh. A report[102] was commissioned from Alan Stratford and Associates to consider the relationship between aviation safeguarding principles and the four corridors. Issues relating to the MOD facilities and the commercial facilities at Elmsett Aerodrome may be considered to be material in terms of corridor selection. Wattisham, to the north of the study area is the home of the Army Air Corps.

Stage 1 Consultation Representations

15.4 A significant number of individual consultees, and Parish Councils in the northern part of the study area, expressed reservations about the potential reduction in safety at Elmsett Aerodrome and the risk of loss of aviation-related employment. Some considered the facilities to be a "rare amenity" in the area. Concern was also expressed about the potential impact on helicopters based at Wattisham.

15.5 The MOD has been consulted on all four corridor options and has confirmed[103] that all are outside MOD safeguarding areas. National Grid has also consulted with the Civil Aviation Authority and National Air Traffic Services, neither of whom has raised any concerns about any of the corridors.

Comparison of Impacts of Corridors

15.6 The aviation studies have concluded that there would be a potential impact on Elmsett Aerodrome by either Corridor 3 or Corridor 4 but that the aerodrome could continue to operate with either option. Hadleigh airstrip would be unaffected by Corridor 4 but operations could be affected by Corridor 3. The airstrip at Milden would be unaffected by Corridor 3, but careful overhead line routeing within Corridor 4 would be required if operation is not to be

[102] Alan Stratford and Associates : Proposed overhead power line Bramford to Twinstead Review of Aviation Impacts : January 2010
[103] Ministry of Defence - Defence Estates Safeguarding : consultation response : 20 October 2009

compromised. The airstrip at Monks Eleigh would be unaffected by Corridor 3, but would be rendered unusable if Corridor 4 were adopted. Nor could Newton remain in use if Corridor 4 were adopted. Corridor 3 would also potentially affect operation of that airstrip. Corridor 4 would therefore be the least favoured option.

15.7 Neither Corridors 1 nor 2 would appear to affect any of the airstrips except that current operations at another airfield, Hands Farm, would require an offset approach if Corridor 2 were adopted.

Conclusions

15.8 The Route Corridor Study mapped the presence of airfields and took account of any aviation consultation zones shown in planning documents. Aviation facilities therefore influenced the definition of the corridors at an early stage in project development. None of the corridors infringes aviation safety zones.

15.9 None of the statutory consultees raised objections to any of the corridors. Nevertheless, National Grid will continue to liaise with the owners and operators of airstrips close to the corridors to ensure that all parties have a clear understanding of the potential effect of overhead lines on their operations.

15.10 Based on the above, it is concluded that Corridors 1 or 2 should be preferred on the basis of aviation interests.

16 CLIMATE CHANGE RESILIENCE AND FLOOD RISK

Introduction

16.1 The National Policy Statement on Electricity Networks before Parliament for approval requires promoters to consider the potential impact of climate change on electricity networks infrastructure. In particular, consideration needs to be given to how the proposal would be resilient to:

- flooding, particularly for sub-stations that are vital for the electricity transmission and distribution network;
- effects of wind and storms on overhead lines;

- higher average temperatures leading to increased transmission losses; and
- earth movement or subsidence caused by flooding and drought for underground cables.

Context

16.2 While all of the corridors cross relatively minor floodplains, alignments can be selected and pylons and other infrastructure positioned such that flooding does not pose a constraint. It is relatively straightforward to build flood resilience into overhead lines by addressing safety clearances from anticipated flood levels in line design. The presence of overhead line pylons in areas of flood risk has negligible effect on the displacement of flood water as the lattice steel construction poses no material changes to water flow.

16.3 The siting of infrastructure such as substations in relation to flood risk is given careful consideration. Bramford substation is located in Zone 1 (Low Flood Risk). The only corridor which would involve a substation additional to that at Bramford would be Corridor 2. Three potential sites for this substation have been identified. Site A (North of Colne Valley Farm Park, Castle Hedingham) lies within an area, part of which is affected by a flood risk zone. If it is determined that Corridor 2 is the preferred corridor, then National Grid will seek further views from statutory consultees (including the Environment Agency), local authorities and the public regarding the siting of the substation.

16.4 National Grid's design standards take account recommendations regarding climate change made following a collaborative project (EP2) led by the Meteorological Office[104]. Current projections around the impact of climate change in the UK forecast extremes of wet and dry (heavy rain and drought) and more occurrences of high wind. Overhead line design for climatic loads is driven by wind, ice and wind-on-ice loadings.

16.5 The risk of simultaneous occurrence of ice on the conductor and intense wind gusts was therefore investigated by the project. The EP2 project found that a reduction in the intensity of the most frequent extreme meteorological

[104] Meteorological Office : Project EP2 Climate Change Impacts on the UK Energy Industry : 2006

conditions likely to cause conductor damage is a possibility. However, the ability of climate models to simulate changes in extreme winds is limited. It is recognised that, at this stage, a marked increase in the intensity of the most extreme cases cannot be ruled out. However, in the absence of robust evidence to the contrary, the project recommended that the industry should continue to use design criteria based on present day risk. The same criteria will apply to an overhead line in any of the corridors.

16.6 Higher average temperatures leading to increased transmission losses would not differ significantly from one corridor to another, given the relatively small differences in corridor length.

16.7 No information has been obtained which suggests that any particular parts of the study area would be affected by earth movement or subsidence.

Stage 1 Consultation Representations

16.8 Few comments were made by respondents relating to climate change resilience or flood risk. Some expressed concern about the ability of the infrastructure to withstand adverse weather conditions and the impact on local communities if the overhead lines were brought down. It was suggested that placing the connection underground would remove this type of risk to the infrastructure. The impact of weather on infrastructure is addressed above.

16.9 The Environment Agency and Anglian Water were consulted but neither has raised any concerns about flood risk.

Conclusions

16.10 It is relatively straightforward to build flood resilience into overhead lines by addressing safety clearances from anticipated flood levels in line design. The presence of overhead line pylons in areas of flood risk has negligible effect on the displacement of flood water as the lattice steel construction poses no material changes to water flow.

16.11 National Grid carefully considers the siting of key infrastructure such as substations in relation to flood risk - this would only be applicable to Corridor 2,

where one option for the substation west of Twinstead Tee lies withion an area where flood risk could be an issue.

16.12 Given the above, there is no distinction between the corridors on the basis of resilience to climate change or flood risk, as the potential risk is similar for all options and can be managed.

17 MITIGATION

17.1 During the Stage 1 Consultation, representations were made concerning how National Grid would seek to mitigate the potential impacts associated with an overhead line. In particular, the use of undergrounding was advocated by various parties, including some of the statutory bodies.

17.2 The overall approach to mitigation is set out in National Grid's Stakeholder Community and Amenity Policy. Commitment 5 confirms that National Grid "*will use best practice environmental impact assessment techniques to assess possible effects of our works and identify opportunities for mitigation measures. In the course of this we will consult with relevant stakeholders and affected landowners. Where works are likely to have an adverse effect on amenity, we will carry out mitigation measures to reduce those effects as far as reasonably practicable*".

17.3 Discussions on mitigation will therefore form an important element of the next stage of consultation when specific effects have been identified as part of the development of the detailed connection design.

17.4 The Route Corridor Study considered the opportunities for routeing overhead lines through the study area between Bramford and Twinstead Tee. However, during the Stage 1 Consultation, the use of undergrounding was advocated by various parties, including statutory bodies. Reference was made to undergrounding the entire connection between Bramford and Twinstead Tee or to undergrounding specific sections of the connection, notably within and adjacent to the Dedham Vale AONB and in the Stour Valley. Consideration has therefore been given to the extent to which this might be applied to each of the corridors.

17.5 The National Policy Statement for Electricity Networks Infrastructure[105] before Parliament for approval states that the IPC will need to weigh the benefits associated with undergrounding against any extra impacts (economic, environmental and social) and technical challenges of undergrounding.

17.6 It states that the IPC should consider :

- The landscape in which the proposed line will be set, (in particular, the proximity to residential areas, and those of natural beauty or historic importance);
- the additional cost of undergrounding;
- the environmental and archaeological consequences of undergrounding.

17.7 In respect of the first of these considerations, Corridors 1 and 2 pass through the nationally designated Dedham Vale Area of Outstanding Natural Beauty in the vicinity of Polstead and Leavenheath and that part of the Stour Valley which is crossed by all of the corridors is managed as part of the AONB. Those other parts of the four corridors locally designated as Special Landscape Areas would have a lower priority for consideration of undergrounding than would the nationally designated AONB.

17.8 The second consideration is the additional cost of undergrounding. As discussed in Chapter 6, the costs associated with undergrounding would be significant.

17.9 The third consideration is the degree to which undergrounding would have adverse effects on the environment and archaeology of the area. The landscapes within and adjacent to the AONB include includes several important habitats such as woodland, hedgerows, hay meadows, open water (ponds and watercourses) and grassland. It also has heritage value. Those characteristics could be threatened by the works required to establish an underground connection. It should also be noted that undergrounding within the AONB could have an adverse impact on the orchards which provide an important element in the local economy. The South Suffolk area is rich in heritage assets, though careful selection of alignments could avoid sites of archaeological interest.

[105] Department for Energy and Climate Change : National Policy Statement for Electricity Networks Infrastructure : Version for Approval : June 2011

17.10 No particular technical challenges have yet been identified which would outweigh amenity arguments for undergrounding.

17.11 National Grid's present approach to undergrounding is that, in identifying places where detailed consideration may be given to the benefits of maintaining visual amenity, it takes account of the views of a range of professional authoritative advisors, statutory environmental bodies and other organisations as appropriate. A workshop was convened in August 2010 to discuss where, on each of the Bramford to Twinstead Tee corridor options, the particularly sensitive or constrained sections are; and where National Grid should focus attention in evaluating and considering the costs and benefits of potential use of underground cables compared to overhead lines. It also considered whether other mitigation measures might be worthy of further evaluation.

17.12 The workshop was attended by National Grid staff and officers from the relevant local authorities, English Nature, the Environment Agency and English Heritage. It was recognised that other bodies and members of the public had expressed specific views about undergrounding but that the attendees held wider remits which would enable them to provide a more objective assessment at this stage. Wider public consultation on potential mitigation, including locations for undergrounding, would be more appropriately undertaken as part of the detailed connection design stage.

17.13 For Corridors 1 and 2 the workshop highlighted three areas for consideration :

- the crossing of the Brett valley south of Hadleigh;
- the area within the AONB south of Boxford;
- the crossing of the Stour valley between Workhouse Green and Twinstead Tee.

17.14 The perceived sensitivity of Corridor 3 was reflected in the observation of consultees that much of the central section of the corridor would be considered likely to benefit particularly from mitigation including undergrounding: - from the north of Hadleigh to the west of Sherbourne Street, as well as the crossing of the Stour valley between Little Cornard and Twinstead Tee.

17.15 For Corridor 4 the workshop cited :

- the crossing of the Brett valley between Nedging and Lindsey Tye;

- the area in the vicinity of Priory Green and Edwardstone;
- the crossing of the Stour valley between Little Cornard and Twinstead Tee.

17.16 In terms of route length, Corridors 1, 2 and 4 all exhibit similar scope for the consideration of undergrounding. The workshop findings suggest that an acceptable degree of mitigation on Corridor 3 could only be achieved by undergrounding a considerable length of the route which would incur very high costs and have a potentially large effect on other environmental and archaeological factors.

17.17 Undergrounding was considered by the workshop to offer a clear benefit in the high value landscape of the Stour Valley. If it is accepted, following further investigations, that undergrounding in the vicinity of the Stour Valley crossing on Corridor 2 would be justified, then similar considerations would also be likely to apply to any of the corridors, including Corridor 4. Because the scope of possible mitigation required is similar in both cases, the workshop suggests that the scope for undergrounding should not be used to select between Corridors 2 and 4.

17.18 Further detailed studies (for example of landscape features, ecology and archaeology) will need to be undertaken to inform a judgement as to whether the amenity and environmental benefits of undergrounding would outweigh the costs and environmental risks (for example to biodiversity and archaeology).

17.19 Using underground cables is one of several ways in which the effects of the connection could be mitigated. The detailed connection design will take account of the Holford Rules in developing the alignment of sections of overhead line and the position of pylons and will be informed by the results of an environmental impact assessment and local consultation. Some representations to Stage 1 Consultation referred to the use of different pylon designs. National Grid is currently engaged in reviewing designs, including those used overseas that could be appropriate for use on National Grid's transmission network, and will consider, and consult upon, alternative pylon designs as part of the development and assessment of the detailed connection design. This will include consideration of the use of low-height pylons in appropriate locations.

18 COMPARISON OF ROUTE CORRIDORS

Statutory obligations

18.1 National Grid is bound by its statutory obligations "*to develop and maintain an efficient, co-ordinated and economical system of electricity transmission*". These statutory obligations are there to protect the consumer and the actions of National Grid are monitored by Ofgem to ensure that they are met. This report has concluded that all of the corridors are capable of providing an efficient transmission connection which can be effectively co-ordinated with the actions of generators and the distribution company to meet the needs of all parties. All of the corridors could accommodate a scheme which would be system compliant and deliverable within the timescale dictated by the connection agreements.

18.2 In view of them being the shortest of the connection options, Corridors 1 and 3 would offer the lowest capital cost solutions (each approximately £47m). Corridor 4 would cost about £54m. Corridor 2 would accrue additional costs associated with the removal of a section of 132kV overhead line and the construction of a new substation west of Twinstead Tee, to ensure that the regional electricity distribution requirements are met, giving a total cost of between £79m and £82m, depending on whether option 2A or 2B were chosen.

18.3 The lowest cost solution is not necessarily the best. National Grid must determine whether the additional costs associated with other options can be justified in terms of reducing the impact of the scheme on amenity and taking into account the concerns of statutory bodies.

18.4 In developing its major projects, National Grid employs a sieving process, seeking at the scheme inception stage to avoid those areas subject to exceptional environmental constraint wherever possible. A Route Corridor Study identified four potential corridors between Bramford and Twinstead Tee. Where, as here, initial project design has been able to identify potential transmission corridors (Corridors 3 and 4) not subject to areas of exceptional constraint, it is National Grid's normal practice to then proceed to develop a scheme on the assumption that a route for an overhead transmission line can be identified. Such an approach is consistent with National Grid's duties under section 9 of the Electricity Act.

18.5 If no overhead lines were already present in the area, then overhead line routeing practice (in accordance with planning policy and the Holford Rules) would seek to avoid the Dedham Vale AONB, which would indicate a preference for a route to the north of the AONB (Corridors 3 or 4). At the Route Corridor Study stage, Corridor 4 was acknowledged as less environmentally constrained when considered against the criteria used to define corridors because it was specifically identified to avoid the Dedham Vale AONB and minimise the amount of the corridor passing through Special Landscape Areas. The corridor is also more distant from the largest settlements in the study area.

18.6 The presence of the existing 132kV and 400kV lines running through the AONB (Corridor 2) presents an opportunity to minimise the scale of change which a new overhead line would bring and avoid incursions into areas unaffected by overhead lines. In early discussions, local authorities had indicated that such an option may be viewed favourably by local communities and that this needed to be weighed against the constraint afforded by AONB designation to a section of the corridor.

18.7 In taking a balanced view of the merits of each corridor taking into account a range of factors (discussed in the main body of this report), National Grid has taken account of the representations made to the Stage 1 Consultation in general and the views of the statutory bodies in particular.

Corridors affecting the AONB

18.8 There is a raft of planning policies at national and local level which aim to protect the environment. These are material considerations. National Grid is also obliged by Section 38 and Schedule 9 of the Electricity Act 1989 to have regard to amenity issues, including the preservation of natural beauty and has set out, in its Schedule 9 Statement, how it will meet the duties placed upon it. This includes seeking to avoid nationally and internationally designated areas where new infrastructure is required and minimising the effects of new infrastructure on other sites valued for their amenity. It has, for many years, adopted the Holford Rules to guide route planning for overhead lines. These encourage the use of the most direct alignment, however Rule 1 states that the major areas of highest amenity value should be avoided altogether if possible, by so planning the route of the line in the first place, even if the total mileage is somewhat increased in consequence.

18.9 The Route Corridor Study identified the Dedham Vale AONB as an important environmental constraint in the study area. National planning policies accord AONBs a high level of protection in relation to landscape and scenic beauty. However, national and local planning policies and National Grid's own duties and policies, including the Holford Rules, do not preclude consideration of routes through an AONB.

18.10 PPS7 requires the need for major development in AONBs to be established and alternatives assessed. Insofar as the proposal is considered to comprise major development for the purposes of this policy, the former is confirmed in the Need Case and the latter is addressed in the present report. In determining whether a route through an AONB would be acceptable, the proposals should be subject to a "most rigorous" examination to see whether exceptionally the development should be permitted to take place in that area. It would be appropriate to consider the impact which the development would have (in particular whether the degree of change to the landscape would be so significant as to affect the purposes of AONB designation) and the impacts which would be associated with alternative route corridors for overhead lines that are located outside the AONB. In both cases the scope for mitigating adverse impacts should be considered. The views of the statutory consultees will be important in assessing the acceptability of proposals affecting an AONB.

18.11 The Stage 1 Consultation confirmed that the landscape and visual impacts of Corridor 1 were considered to be incompatible with AONB status. In a situation where alternatives are available, including the alternative Corridor 2 which would have demonstrably less of an impact on the AONB, planning policies would not support Corridor 1.

18.12 In their response to the Stage 1 Consultation, Natural England commented that Corridor 1 " *would have significant adverse landscape and visual impacts on the nationally important landscape of Dedham Vale AONB and its setting, which would be likely to compromise the purposes of its designation*." English Heritage commented that " *the presence of three lines would increase the adverse impact on this most sensitive area..... We do not therefore recommend selection of this corridor for further consideration*."

18.13 Suffolk County Council considered that " *there is insufficient justification for the installation of a third line of pylons as proposed in option 1*". Babergh District

Council also strongly objected to Corridor 1. The view of the Dedham Vale AONB and Stour Valley Partnership was that "*routes 1 and 2 should have been disregarded in the first instance in order to meet the expectations of section 85 of the Countryside and Rights of Way Act 2000*". This section places a duty on all public bodies and statutory undertakers to have regard to the purposes of AONBs.

18.14 Although the most direct and lowest cost option, Corridor 1 would result in three overhead lines in the landscape (two 400kV overhead lines imperfectly paralleled and a generally adjacent 132kV overhead line) Some of the landscape lies within the AONB, with much of the remainder locally designated as a Special Landscape Area. The cumulative effect of the three lines would result in a significant scale of change in the landscape and in many views. It would not be possible to mitigate the landscape and visual impacts of Corridor 1, other than by extensive use of undergrounding which would not be economical. In addition to its landscape and visual impacts, Corridor 1 would have a direct impact on Hintlesham Woods SSSI and the need for close paralleling would reduce the flexibility to avoid impacts on other sensitive habitats, including woodland, and land uses.

18.15 **It is therefore concluded that Corridor 1 should not be preferred**.

18.16 The position with Corridor 2 is not as clear cut, in that the AONB designation recognised the existence of parallel overhead lines at the time of designation and the adoption of this corridor would not increase the number of lines passing through the AONB (though the scale of the replacement line would be greater). The Government's conservation adviser, Natural England, considered that Corridor 2 "*would minimise the scale of change on the landscape*". However, it recognised that there will be an impact and would like to see full consideration being given to how this impact can be mitigated, including "*a full appraisal of undergrounding of the transmission line in appropriate locations*". This view is supported by other statutory consultees.

18.17 In addition to its landscape impacts, the need for close paralleling on Corridor 2 would reduce the flexibility to avoid impacts on sensitive habitats, including woodland, property and land uses. Corridor 2B may have a direct impact on Hintlesham Woods SSSI.

18.18 Those statutory bodies with responsibilities for protecting and managing the AONB (with the exception of the Dedham Vale AONB and Stour Valley Partnership whose views have previously been referred to) do not discount consideration of Corridor 2.

18.19 Natural England's view is that "*All the route corridor options presented have adverse environmental impacts. Natural England considers that Option 2 has the least impact and we would like more clarity on Option A and Option B around Hintlesham, particularly in connection with Hintlesham Woods Site of Special Scientific Interest (SSSI), before being able to make an informed decision on the sub-route options. We suggest that both sub-routes are included in an Environmental Impact Assessment should Option 2 be chosen. We would also like a detailed consideration of undergrounding in appropriate locations to be undertaken.*"

18.20 English Heritage commented that it was "*mindful of the existing adverse impacts from the two lines in this corridor and accepts that these impacts would be intensified. Additional adverse impacts would be received where new corridors are required around Hintlesham Wood and west of Twinstead where a new substation would be built. However, on balance we consider this corridor potentially would cause the least damage to the settings of heritage assets*." It urged consideration of undergrounding on certain sections of the route.

18.21 Suffolk County Council considered that, subject to acceptance of the principle of constructing a new or replacement overhead line as the solution to perceived reinforcement needs in this area, "*corridor 2b would cause the least environmental damage, but that any parts of a new line running through the sensitive Dedham Vale Area of Outstanding Natural Beauty, the crossing of the Stour Valley south of Sudbury and the immediate setting of these areas should be undergrounded; and that, to compensate at least in part for adverse environmental impact elsewhere and to maximise the environmental benefit, lengths of the existing 400kV line within these areas and their settings should also be undergrounded*."

18.22 While not supportive of any of the options, Babergh District Council resolved that it strongly objected "*to the use of Corridors 1, 3 and 4 in any form*" and that "*were Corridor 2 to be selected by National Grid .... steps be taken to lessen the impact of any power line by under grounding the cables*."

18.23 The overwhelming majority of public representations preferred Corridor 2 and this corridor also attracted the fewest objections. There was strong support for undergrounding as a means of reducing the impact of the proposal.

18.24 It may therefore be concluded that Corridor 2 offers the potential for achieving an acceptable connection. However, given the policy background and the Holford Rules, it is important to review the merits of the corridors which do not pass through the AONB, and the scope for mitigation of adverse effects.

Corridors not affecting the AONB

18.25 Several areas of land covered by the Local Plans of Babergh, Mid Suffolk and Braintree District Councils are designated as 'Special Landscape Areas' (SLAs). These SLAs run northwards from the Dedham Vale AONB following the valleys of the Rivers Stour, Box, Brett and Belstead Brook. These areas are designated for their special landscape qualities and character which Local Plan policies aim to protect and enhance.

18.26 Babergh District Local Plan Policy CRO5 is of specific relevance to the proposal. It states : "*In considering proposals by statutory undertakers and utility providers for buildings and other installations in Special Landscape Areas, particular regard will be paid to siting, design and landscaping. Major utilities and power lines will be permitted only where it can be demonstrated that they do not have a significant detrimental effect on the landscape characteristics of the Special Landscape Area*." The major proportion of Corridors 3 and 4 fall within Babergh District and are therefore subject to this policy. All of the corridors terminate at Twinstead Tee which lies within the Special Landscape Area designated by Braintree District Council.

18.27 Supplementary note B of the Holford Rules notes that, where possible, routes should be chosen which minimise the effect on Special Landscape Areas.

18.28 West of the A134, Corridors 3 and 4 are in common. To the east of this point, approximately 11km of the 20km (55%) of Corridor 3 would run through the Special Landscape Area, while approximately 7km of 23.5km (30%) of Corridor 4 would lie within the designated area (depending on the detailed connection design within the corridors). Corridor 4 must therefore be preferred to Corridor 3 on policy grounds.

18.29 As the Route Corridor Study explains, Corridor 4 was defined to avoid designated areas as far as possible. Hence while Corridor 3 runs through around 13km of SLA, Corridor 4 would run through between 6.5km and 11.5km, depending on detailed connection design. Corridors 1 and 2 run through the greatest lengths of SLA (around 15km) however high voltage overhead lines are an existing feature in the landscape of these corridors whereas Corridors 3 and 4 would introduce an overhead line into SLAs where there are presently no overhead lines.

18.30 Suffolk County Council has resolved that "*routes 3 and 4 should be ruled out as they would traverse extensive areas of countryside currently free from pylon intrusion*". The report to the County Council's Cabinet provided a summary of the reason behind this resolution :

> "*Corridors 3 and 4 pass through areas of unspoilt Suffolk countryside largely designated as Special Landscape Areas by the Local Planning Authorities. These corridors also cut across the landform and a series of landscape types including river valleys, rolling farmland and plateaus that have retained much of their historic pattern and many of their traditional features*."

18.31 The effect on the wider landscape is summed up in the Route Corridor Study. Corridor 3 crosses a moderately complex landscape including four river valley character areas, comprising river and valley farmlands and 4 areas of intervening plateau (interfluves). Corridor 4 crosses only two river valley character areas and runs through a more open larger scale of landscape whose landscape character potentially offers a greater capacity to accommodate the scale of a 400kV overhead line. Both would however introduce a new overhead line into an area regarded locally as high quality landscape, where there is presently no existing electricity infrastructure.

18.32 Corridor 3 passes close to the settlements of Boxford, Groton and Sherbourne Street and generally passes closer to settlements than Corridor 4 - Holford Rules Supplementary Note A advises avoiding routeing close to residential areas where possible on grounds of general amenity. In avoiding most settlements, Corridor 4 takes a more northerly route between Bramford and Twinstead Tee which makes it the longest route at 30km. Landscape and visual effects would therefore extend over a wider area than Corridors 2 or 3.

18.33 Corridor 4 presents the greatest separation from the AONB and the existing 132kV and 400kV line which minimises potential intervisibility between a new overhead line and the existing lines. Corridor 3 runs approximately 2-3km distant from the existing lines giving rise to some intervisibility between lines.

18.34 The Stage 1 Consultation confirmed the high regard which consultees (organisations and individuals) have for the built heritage of South Suffolk and for its historic landscape characteristics. In addition to the views of English Heritage, concerns were expressed by many of the Parish Councils, notably those associated with the Groton Pylon Alliance, about the adverse impacts which Corridors 3 and 4 would have on heritage assets.

18.35 Corridor 3 passes close to the Conservation Areas at Hadleigh, Kersey and Boxford and Grade I and II* Listed Buildings at Aldham Hall and Groton. Consultation representations raised concerns over impacts on the setting of Kersey and Flowton Church. English Heritage was concerned about effects on the former. The corridor also comes within close proximity to the known multi-period settlement site to the north of Hadleigh, indicating a high potential for impacts on buried archaeological remains.

18.36 Corridor 4 passes close to the conservation areas at Chelsworth, Monks Eleigh, Little Waldingfield and Great Waldingfield, also the Scheduled Monument moats at Elmsett, Milden and castle at Milden. Consultation representations specifically raised concerns over potential visual impacts on Monks Eleigh, Flowton Church, Lavenham and Naughton.

18.37 Although the impacts of an overhead line on these assets could be mitigated to some extent by careful route alignment and pylon siting, English Heritage has stated that :

"We feel that new overhead lines anywhere within Corridors 3 or 4 would severely damage the settings of highly graded listed buildings especially the landmark mediaeval churches. Similarly the conservation areas in the nearby villages would be adversely affected in terms of their settings, views in and out and their visual relationships with each other.

English Heritage therefore considers the potential adverse impacts that would be received by heritage assets in or adjoining Corridors 3 or 4 to be of such

significance as to recommend that that neither should be selected for further consideration."

18.38 Natural England has commented that both Corridor 3 and 4 run through the historic landscape of south Suffolk, including several Special Landscape Areas, which are currently devoid of overhead transmission lines. Natural England considers that the installation of a new line in either corridor "*would result in a significant adverse impact on the local landscape character*".

18.39 As noted previously, Babergh District Council expressed outright opposition to Corridors 3 and 4. The report to the Strategy Committee stated the basis for this decision :

"*A new overhead line following the routes identified as Corridors 3 and 4 would pass through an area of landscape that has retained much of its historic pattern and many of its traditional features. As such this largely intact and unspoilt landscape provides a setting to a number of historic settlements including Boxford, Groton, Kersey, Monks Eleigh, Semer, Chelsworth, Aldham and Whatfield and includes a number of significant views. The construction of a new overhead line following one of these routes would therefore be highly undesirable given that there is an option to replace the existing 132kV overhead line that forms the subject of Corridor 2*."

18.40 Mid Suffolk District Council "*strongly opposes corridor options 3 and 4 which will have a serious adverse impact upon that generally undeveloped ancient countryside landscape and will have a harmful impact upon the built environment of those localities and the settings of listed buildings thereabouts*."

18.41 Both Corridors 3 and 4 are wide enough to allow siting of pylons such that impacts on biodiversity can be minimised. This gives them an advantage over Corridor 2. While some concerns were expressed in the Stage 1 Consultation about the potential impacts of Corridor 4 on Milden Thicks and Edwardstone Woods SSSI woodland, there is confidence that alignments can be achieved which avoid these SSSIs. Corridor 2B on the other hand would have a direct impact on Hintlesham Woods SSSI.

18.42 The aviation studies have concluded that there would be a potential impact on Elmsett Aerodrome by either Corridor 3 or Corridor 4. As Corridor 4 would

potentially also compromise safe operations at Monks Eleigh and Newton, it would therefore be the less favoured of the two options.

18.43 In the public response, Corridor 3 was preferred by fewer people than Corridor 4 (66 : 177) and received a degree of opposition comparable to Corridor 4 (1108 : 1113), significantly greater than that attached to the other corridors.

18.44 It is clear from the above that, although they avoid the AONB, Corridors 3 and 4 are not unconstrained in terms of planning policy and environmental sensitivities. Several of the statutory consultees have raised clear objections to these corridors.

18.45 Given the weight attached to matters of policy, the Holford Rules, and the fact that the Route Corridor Study concluded that Corridor 4 potentially offers a greater capacity to accommodate the scale of a 400kV overhead line, it is concluded that of the two corridors outside the AONB, other than its shorter distance/lower cost and a lesser impact on aviation interests, Corridor 3 would appear to offer few advantages over Corridor 4 which would outweigh the policy considerations. **In those circumstances, it is concluded that Corridor 3 should not be adopted as the preferred route corridor**.

Opportunities for mitigation

18.46 As noted above, representations to the Stage 1 Consultation demonstrated high levels of concern regarding effects on the environment if Corridor 4 were selected, with the principal consideration being impact on the landscape. Set against this are the protection afforded to AONBs in planning policy and that, in accordance with overhead line routeing practice (the Holford Rules), routes passing through AONBs should be avoided "*even if the total mileage is somewhat increased in consequence*". Corridor 4 provides such an opportunity and would be the preference if the alternative were an entirely new route passing through the AONB. In this instance, the route affecting the AONB is not an entirely new route, but one where the protected landscape already accommodates 132kV and 400kV lines and where the presence of these lines presents an opportunity to reduce the scale of change which a new overhead line would bring.

18.47 The scope for mitigating the potential impacts of a new overhead line in all corridors has been considered in consultation with local authorities and statutory bodies. This is reported in Chapter 17. It concluded that Corridors 1, 2 and 4 all exhibit a similar scope for the consideration of undergrounding as mitigation, but that it would prove more difficult to attain an acceptable degree of mitigation by undergrounding on Corridor 3 which would also be economically viable.

18.48 Undergrounding was considered by the workshop to offer a clear benefit in the high value landscape of the Stour Valley. Both here and in the AONB further investigation would be required to determine whether the benefits of undergrounding would outweigh the costs to the local economy and environment.

Comparison of Corridors 2 and 4

18.49 The existing overhead lines between Bramford and Twinstead Tee affect the population living along that corridor and its receiving environment. To the west of Hintlesham, along approximately 80% of the route, this impact is related to overhead lines running in parallel, albeit these lines are of different scales. If Corridor 2 were to be adopted, it is accepted that this same population would be affected to a greater degree (associated with the larger scale of the 400kV overhead line compared to the existing 132kV overhead line). The greatest increase in impact would be experienced by the population at the eastern end of the route (Burstall, Hintlesham, Chattisham) where the existing lines currently diverge. In the case of Corridor 2A, a greater population at this end of the route may experience visual impacts as the visual envelope of a 400kV overhead line would be greater than that of the existing 132kV overhead line. Should Corridor 2B be adopted, this same population would benefit from the removal of the existing 132kV line over a distance of about 4km.

18.50 If Corridor 4 were to be adopted then the impacts of the existing overhead lines would remain and, in addition, a new population and receiving environment would be affected by the presence of overhead lines. The open nature of the landscape along this corridor means that, while the scale of a new overhead line may be more readily assimilated, it would still be visible over a wide area. Some of Corridor 4 and much of the adjacent land is designated as Special

Landscape Area and it would be undesirable, in policy terms, to increase the areas of locally designated landscape subject to overhead lines.

18.51 As noted above, there would be similar, though limited, scope for introducing undergrounding on both corridors. In relation to Corridor 2, this would bring about an overall enhancement in any area where the 132kV line was removed and where there was not a replacement overhead line.

18.52 Planning policies and the Holford Rules suggest that any development in the AONB should normally be avoided, which would favour Corridor 4. In comparing Corridors 2 and 4 the analysis of potential impacts is complicated by the fact that while Corridor 2 does involve some development in an AONB, it would involve the replacement of an existing overhead line, albeit with larger scale structures. Corridor 4 would involve a new line in an area that respondents, including the planning authorities and organisations with statutory responsibility for environmental protection, perceive as sensitive and unspoilt countryside even though this is not nationally designated. Corridor 4 would result in a new population being affected by overhead lines, whereas Corridor 2 would concentrate effects in an area whose character and population is already affected by overhead lines. Furthermore, if Corridor 2B were selected, this would involve some environmental and amenity benefits associated with the removal of the existing 132kV line (and no replacement infrastructure) near Hintlesham. The representations to the Stage 1 Consultation, from statutory and other local bodies and from members of the public, preferred the selection of Corridor 2, where a need for the connection is proven, many adding the caveat that undergrounding should be considered.

18.53 Taking all factors into account, it is considered that Corridor 2 should be selected as the preferred corridor.

18.54 The selection of Corridor 2 would incur the additional costs and environmental impacts which would be associated with the need for a new substation west of Twinstead Tee and the dismantling of the 132kV overhead line.

18.55 It has been concluded that the additional costs of a new substation and the dismantling of the 132kV overhead line should be acceptable given the amenity benefits which can be demonstrated and in the context of overall base scheme costs. An appropriate location for a substation can be determined taking account

of the Horlock Rules, local planning policy, environmental assessment and further public consultation.

18.56 In order to establish the case for undergrounding within Corridor 2, further detailed investigations need to be undertaken and options for undergrounding should be subject to environmental impact assessment and further consultation during the next stage of project development.

18.57 In addition to comments related to the potential impact of a scheme on the AONB, respondents to the Stage 1 Consultation also raised issues relating to the treatment of that section of the route crossing the Stour Valley, and to the potential impact of the scheme on landscape, ecology and heritage in the Hintlesham area. It is recommended that further consideration (including environmental impact assessment) of, and consultation upon, these specific issues should be undertaken in developing the scheme.

19 CONCLUSIONS

19.1 On the basis of the evidence presented in this report, it is concluded that :

- **Corridor 2 should be selected as the basis for developing a scheme for an overhead line connection between Bramford and Twinstead Tee;**
- **further studies should be undertaken to evaluate whether the undergrounding of sections of the proposed 400kV overhead lines may be appropriate to mitigate the potential impacts of the scheme on sensitive locations, including within the AONB and Stour Valley, and be subject to further consultation at Stage 2;**
- **further studies should be undertaken to determine the treatment of the Hintlesham sections of the route (Corridor 2A or 2B), to be subject to additional consultation at Stage 2;**
- **further studies should be undertaken to determine the appropriate location of the new substation west of Twinstead Tee, to be subject to additional consultation at Stage 2.**

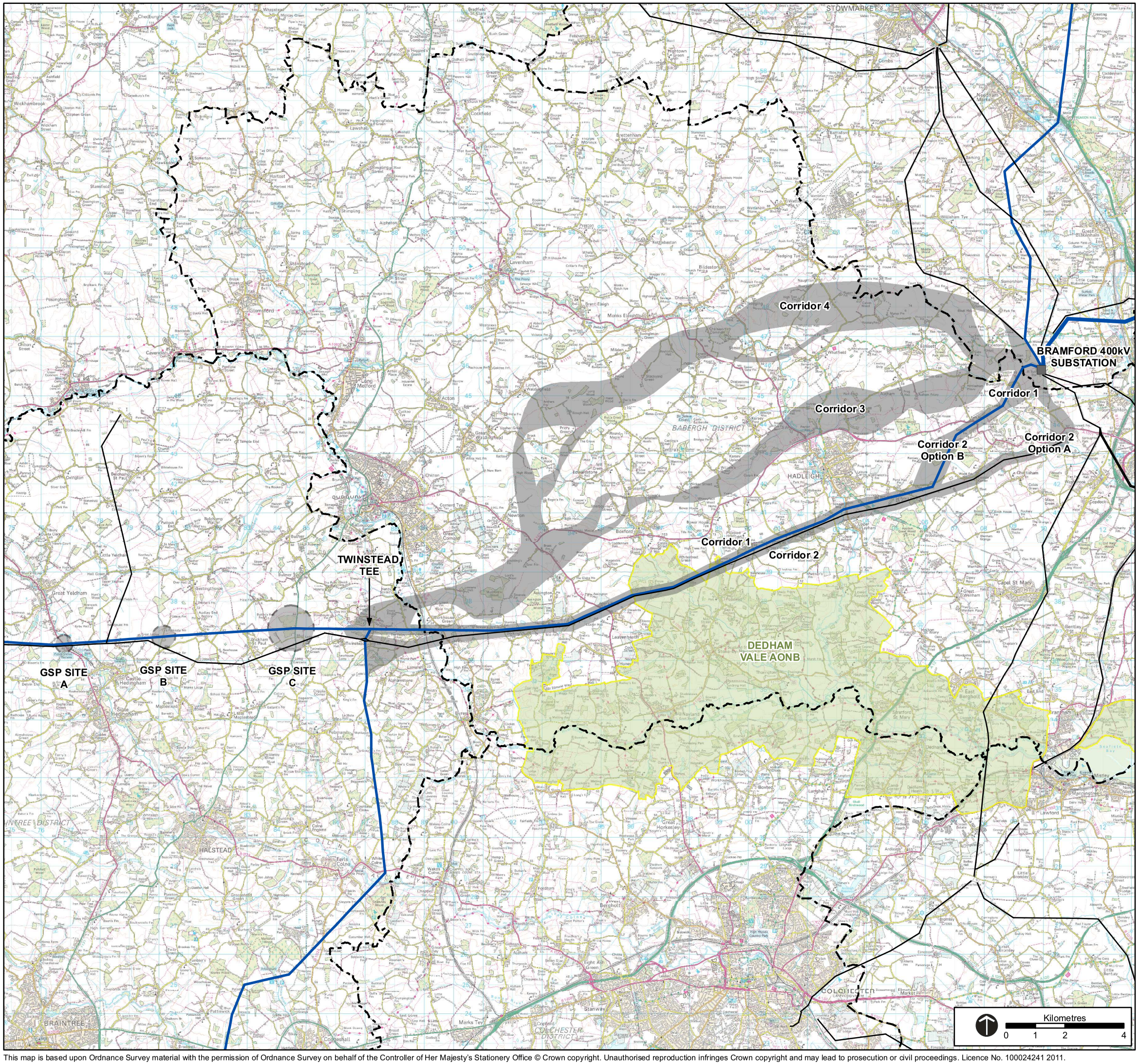
20 NEXT STEPS

20.1 Following the adoption of a preferred corridor, detailed consideration will be given to possible alignments for an overhead line, and pylon locations, within the preferred corridor. The justification for certain sections of transmission line to be undergrounded will also be considered, in accordance with National Grid's updated approach, during development of the detailed connection design. The detailed connection design will be subject to environmental impact assessment (EIA) and further public consultation. The Consultation Strategy for Stage 2 will include the establishment of Community Forums and Thematic Groups to inform the development of a preferred connection option alongside the EIA survey work. It is anticipated that these groups will meet regularly throughout the project life cycle. The refinement of a proposed connection design will emerge as part of the ongoing consultation and EIA process.

20.2 It is anticipated that National Grid's public consultation on the preferred connection option will be undertaken in autumn 2012. The proposal will then be finalised and it is anticipated that a submission will be made to the Infrastructure Planning Commission (or its successor) in 2013, seeking consent for the connection and associated development. Timescales and activities may be subject to alteration as the project progresses.

Appendix 1 : Abbreviations

AC	Alternating Current
ALC	Agricultural Land Classification
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
CBA	Cost Benefit Analysis
DC	Direct Current
DNO	Distribution Network Operator
EC	European Commission
EDF	Electricité de France
EIA	Environmental Impact Assessment
EMF	Electric and Magnetic Fields
ENSG	Electricity Networks Strategy Group
EWEA	European Wind Energy Association
GIL	Gas-Insulated Lines
GIS	Gas-Insulated Switchgear
GSP	Grid Supply Point
GW	Gigawatt
HVDC	High Voltage Direct Current
ICM	Interim Connect and Manage
ICNIRP	International Commission for Non Ionising Radiation Protection
IET	Institution of Engineering and Technology
IPC	Infrastructure Planning Commission
km	Kilometre
kV	Kilovolt
LDD	Local Development Document
LDF	Local Development Framework
LNR	Local Nature Reserve
m	Metre
MVA	Megavolt Ampere
MW	Megawatt
NETS SQSS	National Electricity Transmission System Security and Quality of Supply Standard
NNR	National Nature Reserve
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
OFGEM	Office of Gas and Electricity Markets
PPG	Planning Policy Guidance Note
PPS	Planning Policy Statement
RIIO	Revenue=Incentives+Innovation+Outputs
RPG	Registered Park and Garden
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SGT	Super Grid Transformer
SLA	Special Landscape Area
SM	Scheduled Monument
SOCC	Statement of Community Consultation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TEP	The Environment Partnership
UK	United Kingdom
UKPN	UK Power Networks (formerly Electricité de France)



Key

- Administrative Boundary
- 400kV Route Corridors Under Consideration
- Indicative GSP Site Locations

Existing Infrastructure

- Existing Substation
- Existing 400kV Overhead Line
- Existing 132kV Overhead Line

Environmental Constraints

- Area of Outstanding Natural Beauty

This map includes data from the following sources:
- National Grid
- Natural England

TEP
Genesis Centre
Birchwood Science Park
Warrington WA3 7BH
Tel 01925 844004
Fax 01925 844002
email tep@tep.uk.com

Project: **Bramford to Twinstead Tee Connection**

Title: **Route Corridors**

Drawing No: **Figure 1**

Date:	TEP Ref No:
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Drawn:	Checked:	Approved:
CB	JB	JB

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National Grid plc
1–3 Strand, London WC2N 5EH United Kingdom
Registered in England and Wales No. 4031152
www.nationalgrid.com