AENC-WSP-CNS-REP-0020

Norwich to Tilbury

Volume 5: Reports and statements

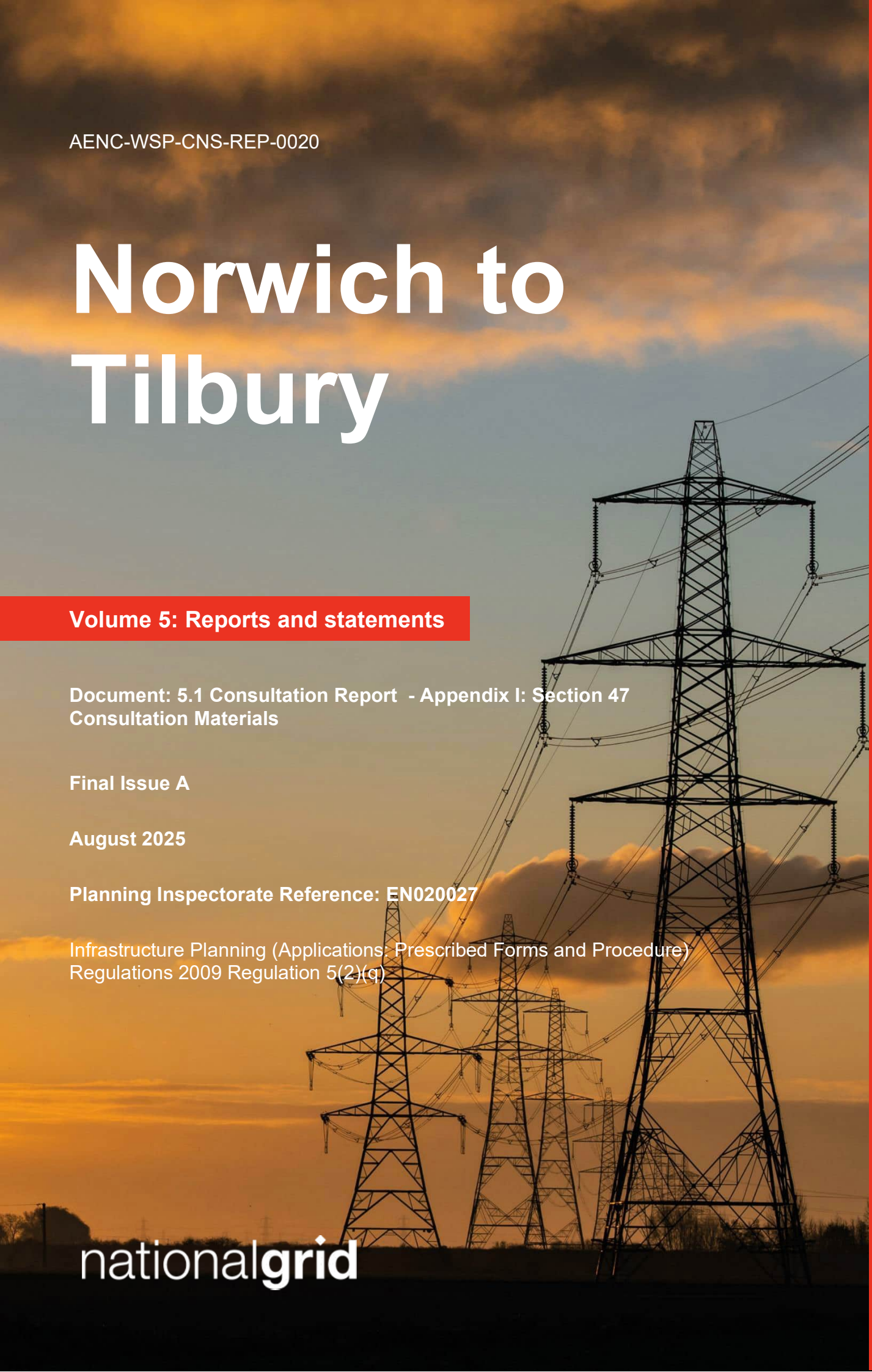
Document: 5.1 Consultation Report - Appendix I: Section 47 Consultation Materials

Final Issue A

August 2025

Planning Inspectorate Reference: EN020027

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 Regulation 5(2)(q)



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Newspaper Adverts

East Anglian Daily Times
10 April 2024



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Essex Chronicle
11 April 2024

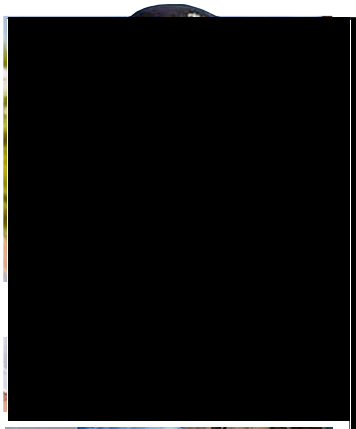
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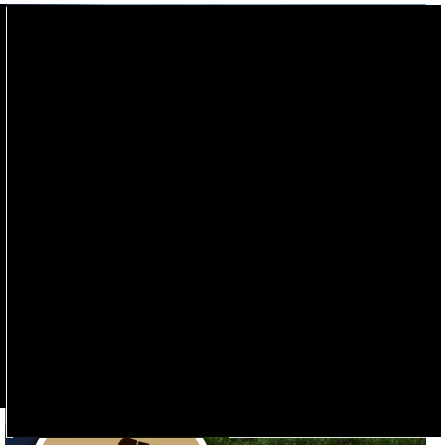
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PAGE 11



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Essex Chronicle
18 April 2024

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The Great Grid Upgrade

Norwich to Tilbury

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East Anglian Daily Times
12 June 2024

OTHER



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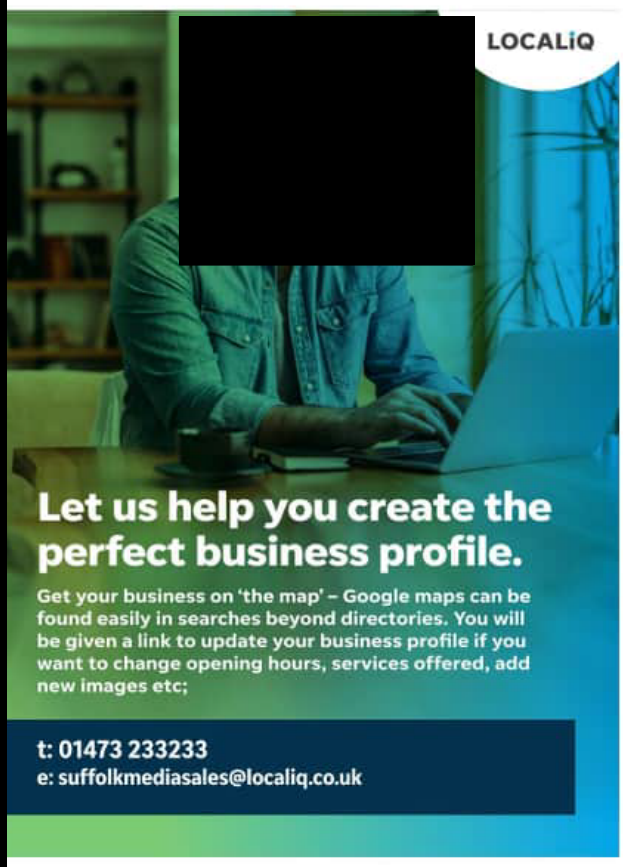
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[redacted]



Eastern Daily Press
12 June 2024

OTHER PLANNING

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Essex Chronicle
13 June 2024



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East Anglian Daily Times
19 June 2024



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Eastern Daily Press
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Essex Chronicle
20 June 2024



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Appendix I2

Social Media Advertising

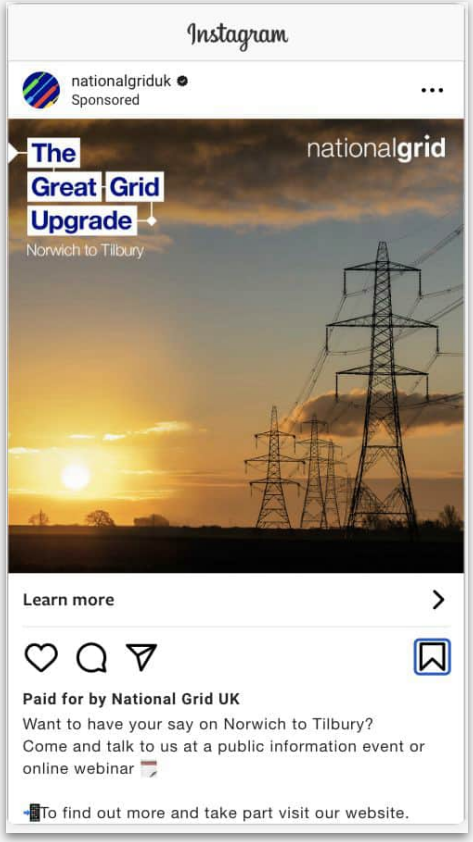
Appendix 2.1
Consultation Launch
Campaign: 15 April 2024 - 26 April 2024

Creatives

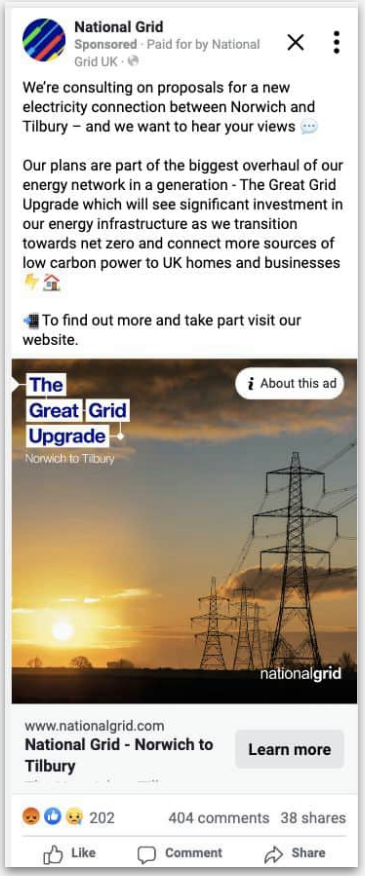


Norwich to Tilbury - IG - Copy 1

TOP PERFORMER

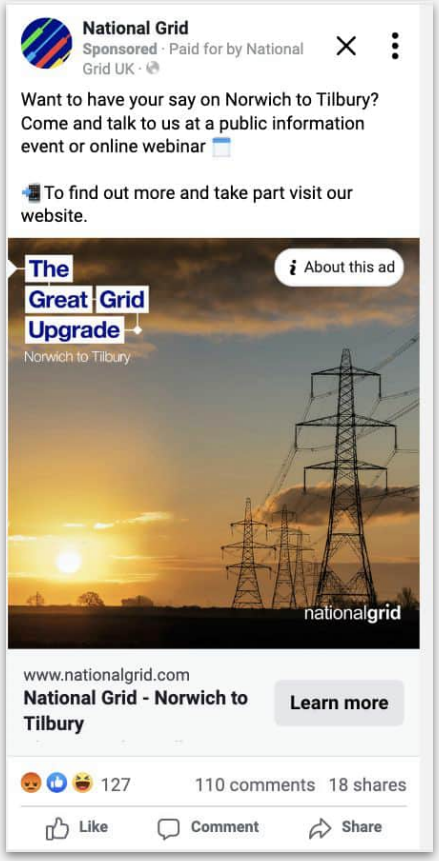


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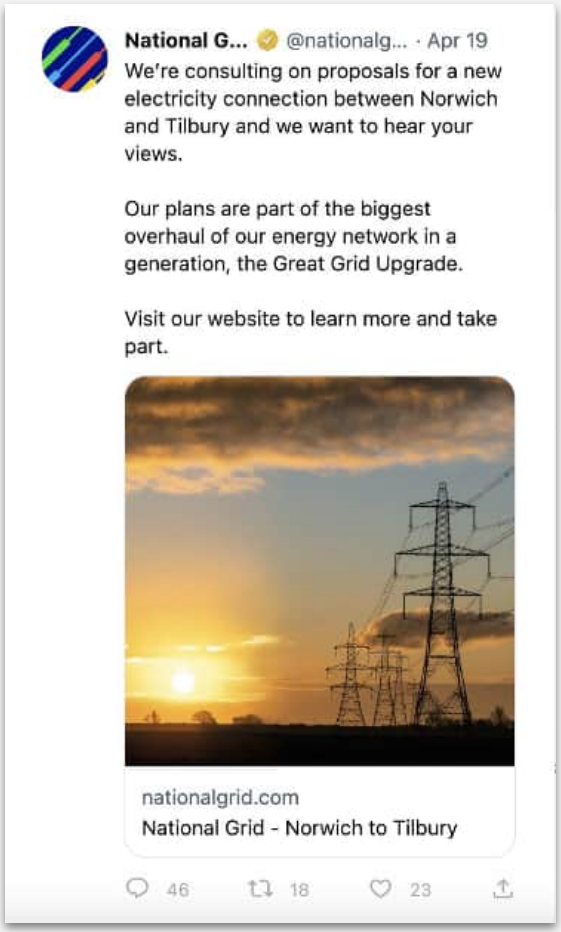
Norwich to Tilbury - FB - Copy 1

TOP PERFORMER



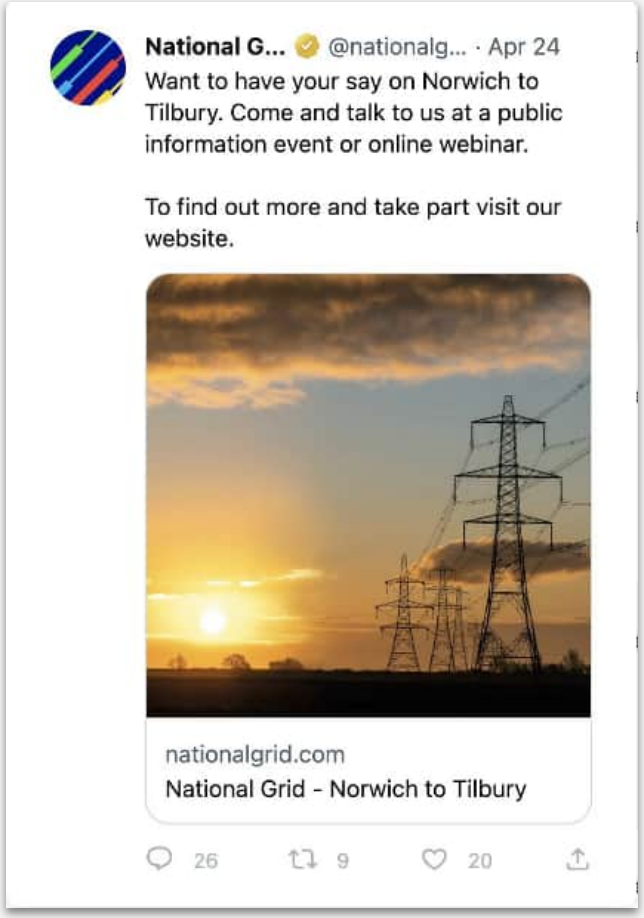
Norwich to Tilbury - FB - Copy 2

Creatives



Norwich to Tilbury - Twitter - Group 1

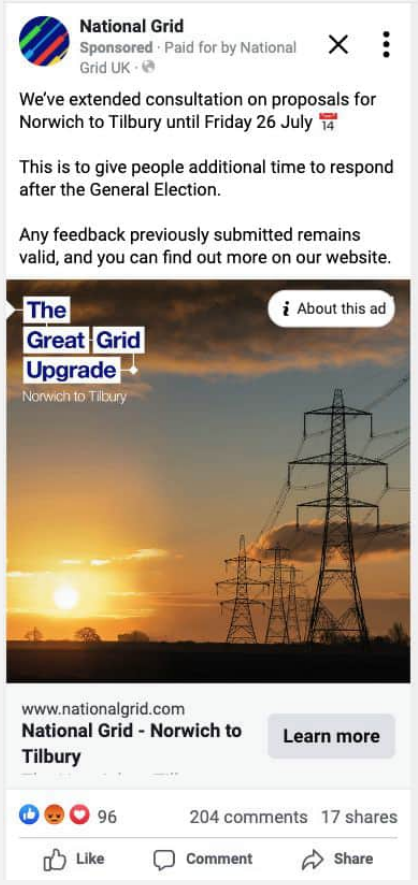
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Norwich to Tilbury - Twitter - Group 2

Appendix 2.2
Consultation Extension
Campaign: 2 July 2024 to 16 August 2024

Creatives



Norwich to Tilbury - Post 1

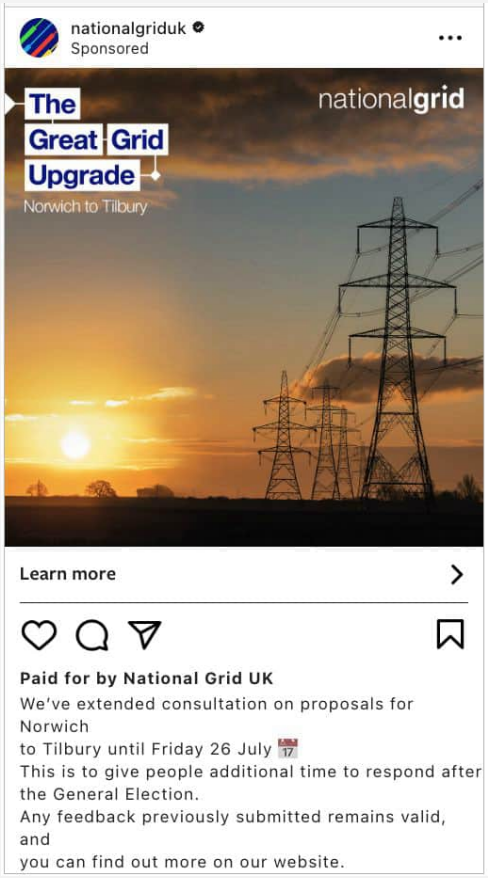


Norwich to Tilbury - Post 2
TOP PERFORMER

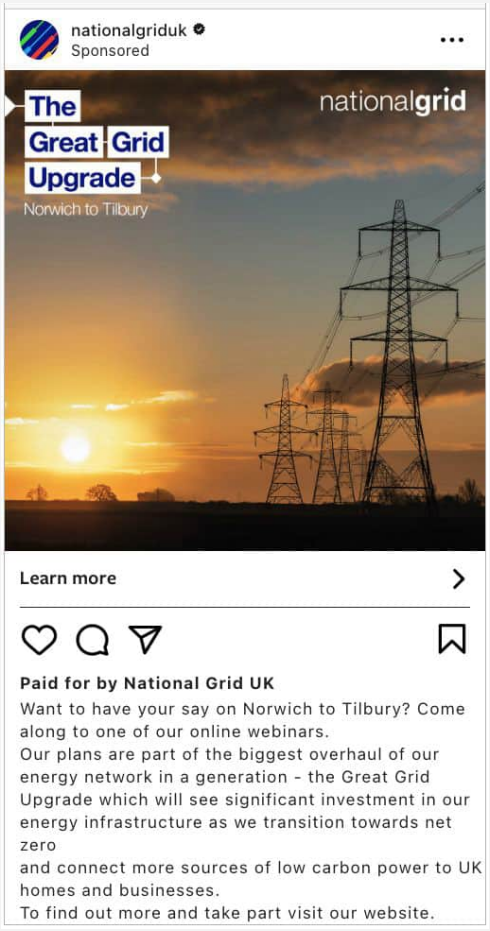


Norwich to Tilbury - Post 3

Creatives

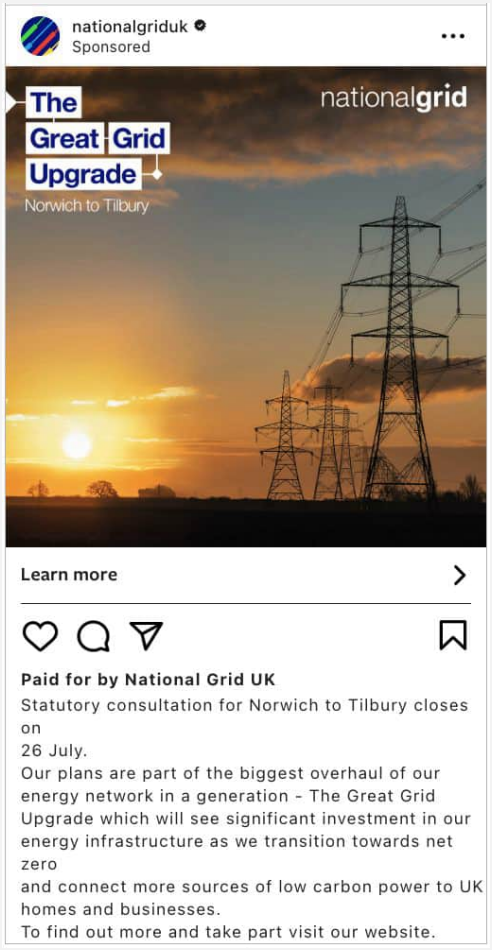


Norwich to Tilbury - Post 1



Norwich to Tilbury - Post 2

TOP PERFORMER



Norwich to Tilbury - Post 3

Appendix I3

Social media guide

nationalgrid

Norwich to Tilbury - Social media guide

This document sets out key information and how we're encouraging communities and individuals to take part in statutory consultation.

Please use this information on your local authority social media channels and in response to any correspondence you may receive about the consultation.

Timings

Consultation will run from Wednesday **10 April (12 noon) until Tuesday 18 June (closing at 11:59pm).**

Promoting the consultation and enabling feedback

The consultation will be promoted through advertising, press releases, social media, and through events and public information points.

All documentation relating to our proposals can be accessed on our Project website www.nationalgrid.com/norwich-to-tilbury where full feedback can be provided.

We will promote the consultation on National Grid UK's X (formerly Twitter), Facebook and Instagram accounts - @NationalGridUK.

We won't be able to accept feedback via social channels. The reason for this is because we want to ensure we're capturing feedback properly, so where practicable we'll point people wanting to comment towards our existing feedback channels. This also gives everyone the same opportunity to respond in a proper way.

Contact channels

The following channels are available to request further information about the proposals or our consultation, and to provide feedback:

- Completing the feedback questionnaire **online** via the Project website: nationalgrid.com/norwich-to-tilbury
- Contacting us by **email** at contact@n-t.nationalgrid.com
- Completing a **paper feedback questionnaire**, which can be provided on request, at one of the designated inspection points, or completed in person at the face-to-face events. The questionnaire can be returned free-of-charge using the Freepost address: FREEPOST N TO T
- Calling our **information line** on 0800 915 2497 †

† Responses to the consultation given orally, such as via telephone or in a meeting, may be considered in exceptional circumstances on a case-by-case basis where someone may not otherwise be able to respond to the consultation.

Public information events

During the consultation we are holding a series of **public information events**. These events will include information about our proposals, with copies of maps and technical documents available to view. Members of the Project team will be available to answer questions about our proposals. We have selected event venues that are close to the proposed route. These are:

Date and time	Venue
Wednesday 24 April 2024 12-5pm	Towngate Theatre, St Martin's Square, Basildon, Essex, SS14 1DL
Thursday 25 April 2024 2-7pm	The Brentwood Centre, Doddinghurst Road, Pilgrims Hatch, Brentwood, CM15 9NN

Saturday 27 April 2024 11am-4pm	Chelmsford City Racecourse, Chelmsford, CM3 1QP
Tuesday 30 April 2024 12-5pm	Gislingham Village Hall, Mill Street, Gislingham, IP23 8JT
Wednesday 1 May 2024 11am-4pm	Copdock Village Hall, Old London Road, Copdock, IP8 3JN
Friday 3 May 2024 1-6pm	Needham Market Community Centre, School St, Needham Market, Ipswich IP6 8BB
Saturday 4 May 2024 11am-4pm	Lawford Venture Centre 2000, Bromley Road, Lawford, Manningtree, CO11 2JE
Wednesday 8 May 2-7pm	The Civic Hall, Blackshots Lane, Grays, RM16 2JU
Thursday 9 May 2024 1-6pm	Thorpe Hall, Ashwell Thorpe and Fundenhall Community Centre, Muskett Road, Ashwellthorpe, NR16 1FD
Friday 10 May 2024 1-6pm	Tibenham Community Hall, Pristow Green Lane, Tibenham, Norwich, NR16 1PX
Tuesday 14 May 2024 11am-4pm	Witham Public Hall, Collingwood Road, Witham CM8 2DY
Wednesday 15 May 2024 1-6pm	Diss Town Football Club, Diss, IP22 4QP
Thursday 16 May 2024 2-7pm	Langham Community Centre, School Road, Langham, Colchester, CO4 5PA
Friday 17 May 2024 1-6pm	Great Bromley Village Hall, Parsons Hill, Great Bromley, Colchester, CO7 7JA

We are also holding **six online webinar sessions**, two of which will cover a general overview of our proposals. The other four will be section specific. Members of the public can attend the webinar most relevant to them. A recording of the general overview webinar will be available to view on our website once available. Details of these webinars are as follows:

Date and time	Topic
Wednesday 17 April 6-7pm	Project Overview One †
Wednesday 29 May 6-7pm	Section A and B – South Norfolk and Mid Suffolk
Thursday 30 May 6-7pm	Section C and D – Babergh, Tendring and Colchester
Wednesday 5 June 6-7pm	Section E and F – Braintree and Chelmsford
Thursday 6 June 6-7pm	Section G and H – Basildon, Brentwood and Thurrock
Wednesday 12 June 6-7pm	Project Overview Two

† British Sign Language interpreter will be available

Inspection Points

Information about Norwich to Tilbury is available to view and collect from the inspection points locations listed below from Wednesday 10 April 2024. We may add inspection points to this list during statutory consultation and will publish additional addresses on the Project website.

Location	Address	Opening Hours
Long Stratton Library	The Street, Long Stratton, NR15 2XJ	Monday 11am-7pm Tuesday 1pm-7pm Wednesday 8am-7pm (unstaffed) Thursday 1pm-7pm Friday 8am-7pm (unstaffed) Saturday 11am-4pm Sunday 10am-4pm (unstaffed)
Norwich Library	Unit 3, The Forum, Millenium Plain, Norwich, NR2 1AW	Monday - Friday 10am-7pm Saturday 9am-5pm
Tuckswood Library	Robin Hood Road, Eaton, NR4 6BX	Monday 8am-7pm (unstaffed) Tuesday 11am-7pm

		Wednesday 8am-7pm (unstaffed) Thursday 8am-7pm (unstaffed) Friday 11am-7pm Saturday 10am-4pm Sunday 10am-4pm (unstaffed)
Diss Library	Church Street, Diss, IP22 4DD	Monday 10am-7pm Tuesday 8am-7pm Wednesday 10am-7pm Thursday 10am-7pm Friday 10am-7pm Saturday 10am-7pm Sunday 10am-4pm
Stowmarket Library	Milton Road, Stowmarket, IP14 1EX	Monday Closed Tuesday 8:30am-6:45pm Wednesday 8:30am-5:45pm Thursday 8:30am-5:45pm Friday 8:30am-6:30pm Saturday 8:30am-4pm Sunday 10am-4pm
Capel St Mary Library	Village Hall, The Street, Capel St Mary, IP9 2EF	Monday Closed Tuesday 9am-12:30pm, 2-5:30pm Wednesday and Thursday 9am-12:30pm Friday 2-5:30pm Saturday 9am-3pm Sunday 10am-3pm
Coggeshall Library	The Friends, Meeting House, Stoneham Street, Coggeshall, CO6 1UH	Monday Closed Tuesday 2-5:30pm Wednesday Closed Thursday 9am-5:30pm Friday Closed Saturday 9am-5pm Sunday Closed
Chelmsford Library	Market Road, Chelmsford, CM1 1QH	Monday 9am-5:30pm Tuesday 9am-5:30pm Wednesday 9am-5:30pm Thursday 9am-7pm Friday 9am-5.30pm Saturday 9am-5pm Sunday 10:30am-1:30pm
Colchester Library	Trinity Square, Colchester, CO1 1JB	Monday 9am-5:30pm Tuesday 9am-5:30pm Wednesday 9am-7pm Thursday 9am-5:30pm Friday 9am-5:30pm Saturday 9am-5pm Sunday 1-4pm
Tilbury Library	Civic Square, Tilbury, RM18 8AD	Monday 10am-1pm and 2-5pm Tuesday Closed Wednesday 10am-1pm and 2-5pm Thursday - Sunday Closed
Greenstead Library	Hawthorn Avenue, Colchester, CO4 3QE	Monday 9am-5:30pm Tuesday 9am-5:30pm Wednesday Closed Thursday 9am-5:30pm Friday Closed Saturday 9am-5pm Sunday Closed
Stanway Library	10 Villa Road, Stanway, CO3 0RH	Monday Closed Tuesday 2-7pm

		Wednesday Closed Thursday 9am-1pm Friday Closed Saturday 9am-1pm Sunday Closed
Prettygate Library	Prettygate Road, Colchester, CO3 4EQ	Monday Closed Tuesday 9am-7pm Wednesday 9am-5:30pm Thursday Closed Friday 9am-5:30pm Saturday 9am-5pm Sunday Closed
Wivenhoe Library	104/6 High Street, Wivenhoe, CO7 9AB	Monday Closed Tuesday 2-7pm Wednesday Closed Thursday 9am-5:30pm Friday Closed Saturday 9am-5pm Sunday Closed

Appendix I4

Press Releases

Appendix I4.1
Press Release Consultation Launch

PRESS RELEASE

April 2024

Opportunity for communities to have their say on National Grid proposals for Norwich to Tilbury

- New clean energy sources – particularly offshore wind – will soon be connecting into the East Anglian electricity network.
- Project will help UK achieve net zero by 2050
- National Grid is consulting communities for 10 weeks as part of statutory consultation, between Wednesday 10 April to Tuesday 18 June.

National Grid is encouraging communities in East Anglia to comment on proposals to upgrade the high voltage power network in England to connect new sources of offshore energy to the energy network as part of a 10-week statutory consultation process which runs between Wednesday 10 April and Tuesday 18 June.

The Norwich to Tilbury project is needed because the existing transmission network in East Anglia doesn't have sufficient capacity to manage the expected increase in offshore wind needing to connect in the coming years and beyond. By developing the Project, National Grid will be able to connect new sources of low carbon energy to homes and businesses across Britain and help reduce our reliance on fossil fuels. In doing so, it will play a key role in addressing the climate emergency and helping achieve the UK's targets for net zero.

Over more than two years of development, the project team has listened to public feedback from two non-statutory public consultations in 2022 and 2023. This consultation is an opportunity for members of the public to see how the design of the Project has progressed and how previous feedback has been considered before National Grid submits a planning application to the Planning Inspectorate.

Liam Walker, Project Director for Norwich to Tilbury, commented: "Our plans are an essential part of the biggest overhaul of our energy network in a generation. By developing this project we will be able to connect new sources of low carbon energy to homes and business across Britain."

Over the ten-week period, members of the public will be able to attend 14 public information events, join webinars and view information at inspection points.

The following table shows when and where the public information events are being held:

Date and time	**Venue**
Wednesday 24 April 2024 12-5pm	Towngate Theatre, St Martin's Square, Basildon, Essex SS14 1DL
Thursday 25 April 2024 2-7pm	The Brentwood Centre, Doddinghurst Road, Pilgrims Hatch, Brentwood, CM15 9NN
Saturday 27 April 2024 11am-4pm	Chelmsford City Racecourse, Chelmsford, CM3 1QP
Tuesday 30 April 2024 12-5pm	Gislingham Village Hall, Mill Street, Gislingham, IP23 8JT
Wednesday 1 May 2024 11am-4pm	Copdock Village Hall, Old London Road, Copdock, IP8 3JN
Friday 3 May 2024 1-6pm	Needham Market Community Centre, School St, Needham Market, Ipswich IP6 8BB

DRAFT

PRESS RELEASE

April 2024

Saturday 4 May 2024 11am-4pm	Lawford Venture Centre 2000, Bromley Road, Lawford, Manningtree CO11 2JE
Wednesday 8 May 2-7pm	The Civic Hall, Blackshots Lane, Grays, RM16 2JU
Thursday 9 May 2024 1-6pm	Thorpe Hall, Ashwell Thorpe and Fundenhall Community Centre, Muskett Road, Ashwellthorpe, NR16 1FD
Friday 10 May 2024 1-6pm	Tibenham Community Hall, Pristow Green Lane, Tibenham, Norwich NR16 1PX
Tuesday 14 May 2024 11am-4pm	Witham Public Hall, Collingwood Road, Witham, CM8 2DY
Wednesday 15 May 2024 1-6pm	Diss Town Football Club, Diss, IP22 4QP
Thursday 16 May 2024 2-7pm	Langham Community Centre, School Road, Langham, Colchester, CO4 5PA
Friday 17 May 2024 1-6pm	Great Bromley Village Hall, Parsons Hill, Great Bromley, Colchester, CO7 7JA

All information about the consultation and how to give feedback can be found on the project website at nationalgrid.com/norwich-to-tilbury

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Appendix I4.2
Press Release Consultation Extension

PRESS RELEASE

May 2024

Consultation extended on National Grid proposals for Norwich to Tilbury

- National Grid has extended statutory consultation on proposals for Norwich to Tilbury until Friday 26 July.
- Provides additional time for people to submit their feedback after the General Election.
- New dates for webinars have been announced.

National Grid is extending its statutory consultation on proposals for Norwich to Tilbury until Friday 26 July. The consultation remains open, and this five-week extension will allow people more time to provide their comments following the Prime Minister's announcement that a General Election will be held on 4 July.

National Grid is also moving its five remaining webinars until after the general election takes place.

Norwich to Tilbury is needed to connect new sources of low carbon energy to homes and businesses across Britain and help reduce our reliance on fossil fuels. It will play a key role in addressing the climate emergency and helping achieve the UK's targets for net zero.

[redacted], Project Director for Norwich to Tilbury, said: "We'd like to thank everyone for taking part in our statutory consultation so far, your comments and feedback are invaluable in helping to refine our proposals for this important development.

"In light of the general election, we felt it was important to extend the deadline for consultation responses and give everyone time to provide their comments. If you haven't yet done so, please do get involved, visit our website and find out more."

National Grid is encouraging anyone who wants to find out more to visit its website and register for one of its revised webinar dates:

Date and Time	**Topic**
Wednesday 10 July: 6-7pm	Section A and B South Norfolk and Mid Suffolk
Thursday 11 July: 6-7pm	Section C and D Babergh, Tendring and Colchester
Tuesday 16 July: 6-7pm	Section E and F – Braintree and Chelmsford
Wednesday 17 July: 6-7pm	Section G and H Basildon, Brentwood and Thurrock
Thursday 18 July: 6-7pm	Project Overview Two

All feedback which has already been provided will continue to be valid.

Further information about the consultation, including how to provide feedback and sign up for webinars can be found on the project website at nationalgrid.com/norwich-to-tilbury.

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PRESS RELEASE

May 2024

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Appendix I5

Poster



The Great Grid Upgrade

Norwich to Tilbury

nationalgrid

Statutory consultation

Wednesday 10 April to Tuesday 18 June 2024

We're consulting on proposals for a new electricity connection between Norwich and Tilbury – and we want to hear your views.

Our plans are part of the biggest overhaul of our energy network in a generation – The Great Grid Upgrade – which will see significant investment in our energy infrastructure as we transition towards net zero and connect more sources of low carbon power to UK homes and businesses.

To find out more and take part visit our website **nationalgrid.com/norwich-to-tilbury** or come along to one of the public information events listed below.

Date and time	Venue
Wednesday 24 April 2024 12-5pm	Towngate Theatre, St Martin's Square, Basildon, Essex SS14 1DL
Thursday 25 April 2024 2-7pm	The Brentwood Centre, Doddinghurst Road, Pilgrims Hatch, Brentwood CM15 9NN
Saturday 27 April 2024 11am-4pm	Chelmsford City Racecourse, Chelmsford CM3 1QP
Tuesday 30 April 2024 12-5pm	Gislingham Village Hall, Mill Street, Gislingham IP23 8JT
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Friday 3 May 2024 1-6pm	Needham Market Community Centre, School St, Needham Market, Ipswich IP6 8BB
Saturday 4 May 2024 11am-4pm	Lawford Venture Centre 2000, Bromley Road, Lawford, Manningtree CO11 2JE
Wednesday 8 May 2-7pm	The Civic Hall, Blackshots Lane, Grays RM16 2JU
Thursday 9 May 2024 1-6pm	Thorpe Hall, Ashwell Thorpe and Fundenhall Community Centre, Muskett Road, Ashwellthorpe NR16 1FD
Friday 10 May 2024 1-6pm	Tibenham Community Hall, Pristow Green Lane, Tibenham, Norwich NR16 1PX
Tuesday 14 May 2024 11am-4pm	Witham Public Hall, Collingwood Road, Witham CM8 2DY
Wednesday 15 May 2024 1-6pm	Diss Town Football Club, Diss IP22 4QP
Thursday 16 May 2024 2-7pm	Langham Community Centre, School Road, Langham, Colchester CO4 5PA
Friday 17 May 2024 1-6pm	Great Bromley Village Hall, Parsons Hill, Great Bromley, Colchester CO7 7JA

We're also holding online webinar events. A full schedule and information on how to register can be found on our website.

Contact the team and leave your feedback by:

- emailing us at **contact@n-t.nationalgrid.com**
- writing to us at **FREEPOST N TO T**
- filling out an online feedback questionnaire at **nationalgrid.com/norwich-to-tilbury**
- calling us on **0800 915 2497**

Appendix I6

Postcard



The Great Grid Upgrade

Norwich to Tilbury

nationalgrid

Statutory consultation extended until 26 July 2024

We are extending our public consultation on proposals for Norwich to Tilbury until 11:59pm on Friday 26 July 2024 to give people additional time to have their say and provide feedback after the General Election.

Feedback previously submitted during this consultation remains valid. If anyone wishes to submit any further feedback or comments, they can do so.

We've rescheduled our five outstanding webinars, see below. You can register for them via our Project website.

Date and time	Topic
Wednesday 10 July 2024 6pm–7pm	Section A and B South Norfolk and Mid Suffolk
Thursday 11 July 2024 6pm–7pm	Section C and D Babergh, Tendring and Colchester
Tuesday 16 July 2024 6pm–7pm	Section E and F Braintree and Chelmsford
Wednesday 17 July 2024 6pm–7pm	Section G and H Basildon, Brentwood and Thurrock
Thursday 18 July 2024 6pm–7pm	Project Overview Two

For more information on our proposals for Norwich to Tilbury and how to take part in our statutory consultation, visit our website at:
nationalgrid.com/norwich-to-tilbury

0800 915 2497 **contact@n-t.nationalgrid.com**
FREEPOST N TO T **nationalgrid.com/norwich-to-tilbury**

Address
Line 1
Line 2
Line 3
Line 4

Return address: N-T Community Relations Team, Camargue, Eagle Tower, Montpellier Drive, GL50 1TA

Appendix I7

Webinar Notifications

Webinar guest notification

Dear Sir / Madam

Norwich to Tilbury – Webinars moved

We are moving our upcoming series of Norwich to Tilbury webinars in order to accommodate the general election on 4 July. This means we'll be extending our consultation and will, in the coming days, publicise the extension date and the revised webinar dates.

We're doing this to give the public, their representatives, landowners and stakeholders the time and opportunity to have their say and provide feedback on our proposals after the forthcoming General Election.

Consultation remains open throughout this pre-election period, and you can still take part and provide your feedback by:

Visiting our website:

Visit **nationalgrid.com/norwich-to-tilbury** where you will find maps, technical documents, the Preliminary Environmental Information Report (PEIR) and our online feedback questionnaire. You can also access our latest interactive Project map.

A recording of the first Project Overview webinar is also available on our website with accompanying British Sign Language interpretation.

Completing a feedback questionnaire:

Your feedback is important to us. You can submit your comments online through our Project website or by sending a feedback questionnaire or a letter to us by using our freepost address –Freepost N TO T. You can also submit your feedback via email to the Project email address – contact@n-t.nationalgrid.com.

We will be in contact in the coming days with consultation extension date and dates for our upcoming webinars.

If you have any questions, please do let us know.

Webinar guest notification

Dear Sir / Madam

Norwich to Tilbury – Consultation extension

Thank you for previously registering for one of our Norwich to Tilbury webinars.

We are extending our public consultation until 11:59pm on **Friday 26 July 2024**. We're doing this to give the public, their representatives, landowners and stakeholders additional time and opportunity to have their say and provide feedback on our proposals after the forthcoming General Election. All feedback previously submitted during this consultation remains valid, but if anyone wishes to submit further comments or feedback, they can do so.

We've now rescheduled our webinars and the new dates are below. You can register for them via our Project website, here.

Date and Time	**Topic**
Wednesday 10 July: 6-7pm	Section A and B South Norfolk and Mid Suffolk
Thursday 11 July: 6-7pm	Section C and D Babergh, Tendring and Colchester
Tuesday 16 July: 6-7pm	Section E and F – Braintree and Chelmsford
Wednesday 17 July: 6-7pm	Section G and H Basildon, Brentwood and Thurrock
Thursday 18 July: 6-7pm	Project Overview Two

A recording of the first Project Overview webinar is also available on our website with accompanying British Sign Language interpretation.

If you can't make any of our webinars, you can still take part and provide your feedback if you haven't already done so. You can do this by:

Visiting our website:

Visit nationalgrid.com/norwich-to-tilbury where you will find all maps, technical documents, the Preliminary Environmental Information Report (PEIR) and our online feedback questionnaire. You can also access our latest interactive Project map.

Completing a feedback questionnaire:

Your feedback is important to us. You can submit your comments online through our Project website or by sending a feedback questionnaire or a letter to us by using our freepost address –Freepost N TO T.

You can also submit your feedback via email to the Project email address – contact@n-t.nationalgrid.com.

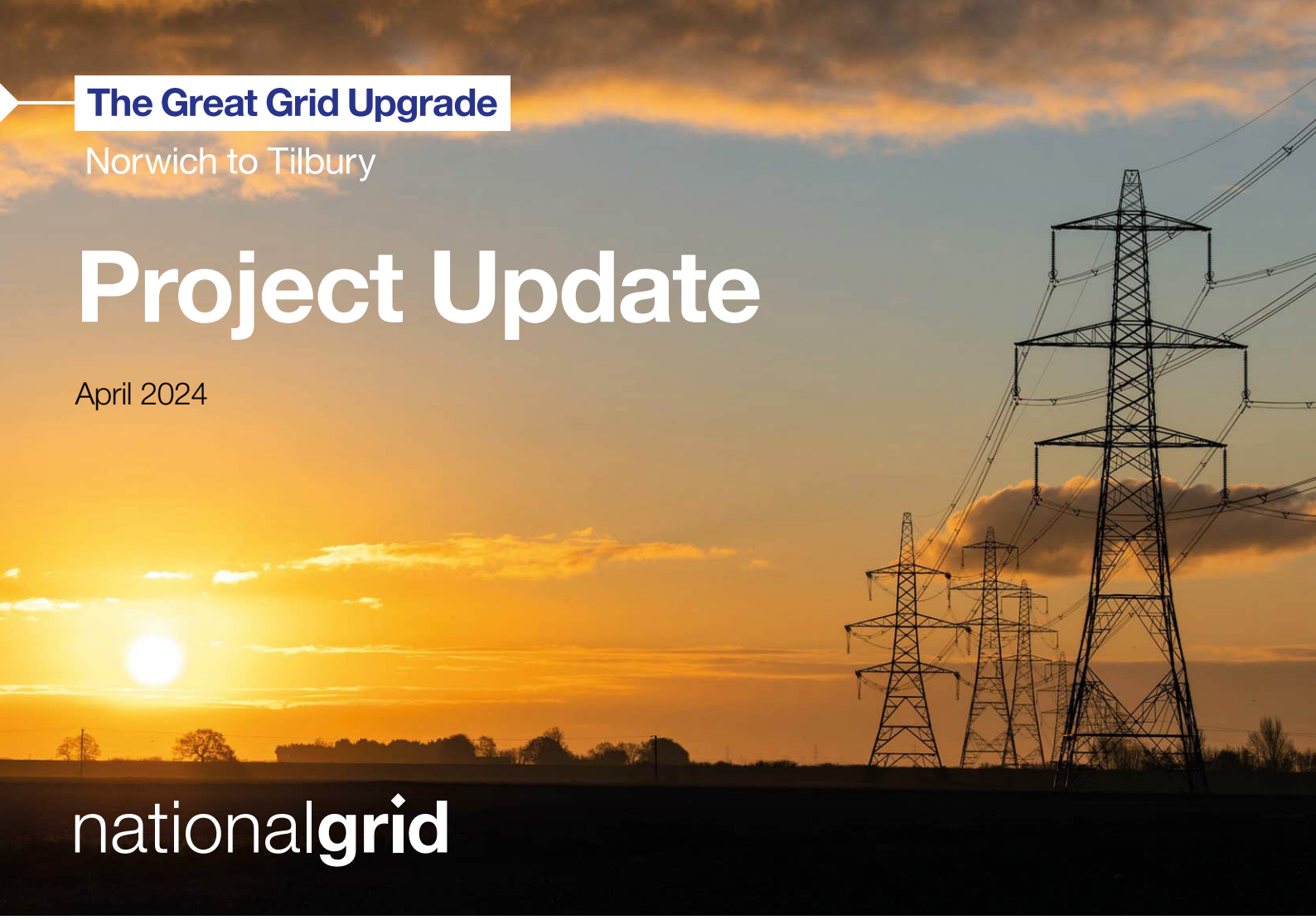
What happens after consultation closes?

Following the close of the statutory consultation, we will consider all the feedback submitted and, together with the findings from ongoing technical and environmental studies, we will aim to finalise the details for the project before submitting an application to the Planning Inspectorate next year.

If you have any questions, please do let us know.

Appendix I8

Project Updates



The Great Grid Upgrade

Norwich to Tilbury

Project Update

April 2024

nationalgrid

Public consultation starts

Today we are launching the statutory public consultation on our proposals for Norwich to Tilbury. We want to hear your views on proposals to upgrade the high voltage power network in England to connect new sources of offshore energy to the energy network. The consultation will run for 10 weeks from Wednesday 10 April, closing at midnight on Tuesday 18 June 2024.

We need to build Norwich to Tilbury because the existing transmission network in East Anglia doesn't have sufficient capacity to manage the expected increase in offshore wind needing to connect in the coming years and beyond. It would enable us to connect new sources of low carbon energy to homes and businesses across Britain and help reduce our reliance on fossil fuels. In doing so, it will play a key role in addressing the climate emergency and helping achieve the UK's targets for net zero.

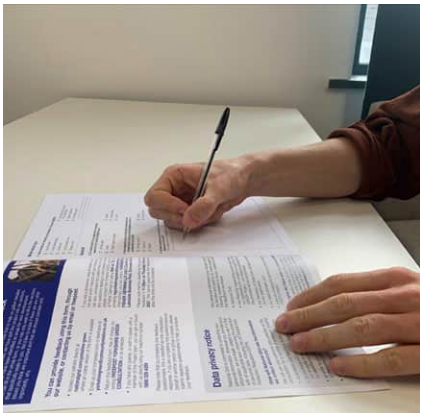
This statutory consultation follows two previous public consultations in 2022 and 2023. We have carefully considered all feedback received, along with technical and environmental assessments as we have developed our proposals.

Have your say

This consultation is an opportunity to see how we have developed our plans and how previous feedback has been considered. It is your opportunity to have your say on our updated proposals.

Visiting our website

Visit **nationalgrid.com/norwich-to-tilbury** where you will find all maps, technical documents, the PEIR, consultation materials and our online feedback questionnaire.



Completing a feedback questionnaire

Complete and return a feedback questionnaire to us. You can do this online through our Project website, in-person at a public information event, or by sending your feedback questionnaire or a letter to us by using our freepost address – Freepost N TO T. You can also submit your feedback via email to the Project email address – **contact@n-t.nationalgrid.com**.



Visit an inspection point

Information about Norwich to Tilbury is available to view and collect from locations along the preferred draft alignment.

A list of inspection points can be found at **nationalgrid.com/norwich-to-tilbury**

Attending a public information event

Come to one of our public information events or webinars to view our proposals, speak to members of the Project team and read all the consultation materials, including our Project Background Document which outlines our proposals.

We have selected event venues that are close to the proposed route. Larger event venues are highlighted with * where there will be more space to view displays and digital materials.

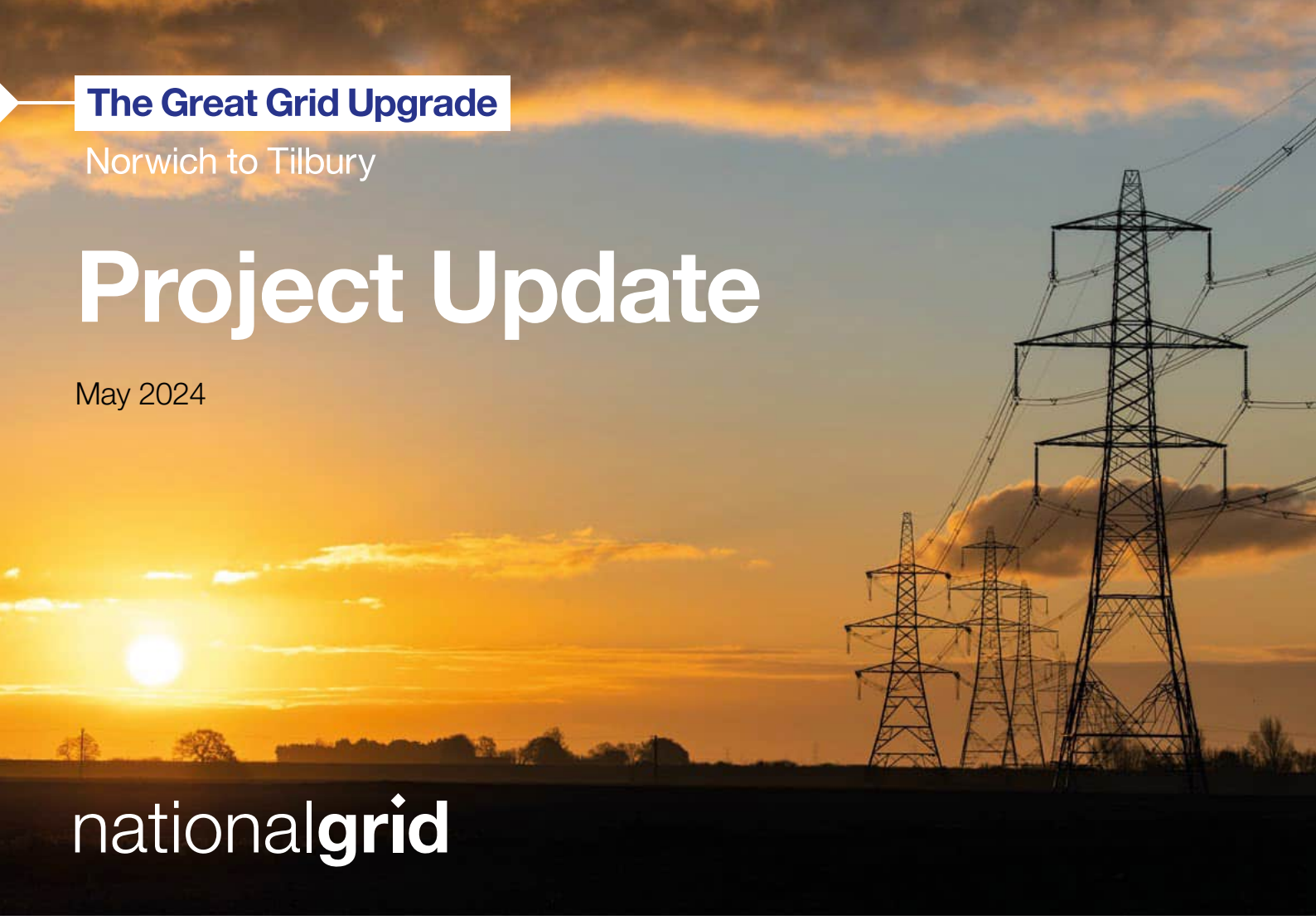
Date and time	Venue
Wednesday 24 April 2024 12-5pm	Towngate Theatre, St Martin's Square, Basildon, Essex SS14 1DL
Thursday 25 April 2024 2-7pm	The Brentwood Centre, Doddinghurst Road, Pilgrims Hatch, Brentwood CM15 9NN *
Saturday 27 April 2024 11am-4pm	Chelmsford City Racecourse, Chelmsford CM3 1QP *
Tuesday 30 April 2024 12-5pm	Gislingham Village Hall, Mill Street, Gislingham IP23 8JT
Wednesday 1 May 2024 11am-4pm	Copdock Village Hall, Old London Road, Copdock IP8 3JN
Friday 3 May 2024 1-6pm	Needham Market Community Centre, School St, Needham Market, Ipswich IP6 8BB
Saturday 4 May 2024 11am-4pm	Lawford Venture Centre 2000, Bromley Road, Lawford, Manningtree CO11 2JE
Wednesday 8 May 2-7pm	The Civic Hall, Blackshots Lane, Grays RM16 2JU *
Thursday 9 May 2024 1-6pm	Thorpe Hall, Ashwell Thorpe and Fundenhall Community Centre, Muskett Road, Ashwellthorpe NR16 1FD
Friday 10 May 2024 1-6pm	Tibenham Community Hall, Pristow Green Lane, Tibenham, Norwich NR16 1PX
Tuesday 14 May 2024 11am-4pm	Witham Public Hall, Collingwood Road, Witham CM8 2DY
Wednesday 15 May 2024 1-6pm	Diss Town Football Club, Diss IP22 4QP
Thursday 16 May 2024 2-7pm	Langham Community Centre, School Road, Langham, Colchester CO4 5PA
Friday 17 May 2024 1-6pm	Great Bromley Village Hall, Parsons Hill, Great Bromley, Colchester CO7 7JA

Attending a webinar

Join one of our digital information events by signing up on our Project website.

Date and time	Topic
Wednesday 17 April 6-7pm	Project Overview One †
Wednesday 29 May 6-7pm	Section A and B – South Norfolk and Mid Suffolk
Thursday 30 May 6-7pm	Section C and D – Babergh, Tendring and Colchester
Wednesday 5 June 6-7pm	Section E and F – Braintree and Chelmsford
Thursday 6 June 6-7pm	Section G and H – Basildon, Brentwood and Thurrock
Wednesday 12 June 6-7pm	Project Overview Two

† A British Sign Language interpreter will be available



The Great Grid Upgrade

Norwich to Tilbury

Project Update

May 2024

nationalgrid

We are extending our statutory consultation until **11:59pm on Friday 26 July 2024**. We're doing this to give the public, their representatives, landowners and stakeholders additional time and opportunity to have their say and provide feedback on our proposals after the forthcoming General Election, which will take place on 4 July 2024.

We've also moved the dates of our five remaining Project webinars. The revised dates for these webinars are set out below, and you can register for them via our **Project website**. If you're already registered, you should receive a separate email.

Date and time	Topic
Wednesday 10 July 2024 6pm–7pm	Section A and B – South Norfolk and Mid Suffolk
Thursday 11 July 2024 6pm–7pm	Section C and D – Babergh, Tendring and Colchester
Tuesday 16 July 2024 6pm–7pm	Section E and F – Braintree and Chelmsford
Wednesday 17 July 2024 6pm–7pm	Section G and H – Basildon, Brentwood and Thurrock
Thursday 18 July 2024 6pm–7pm	Project Overview Two

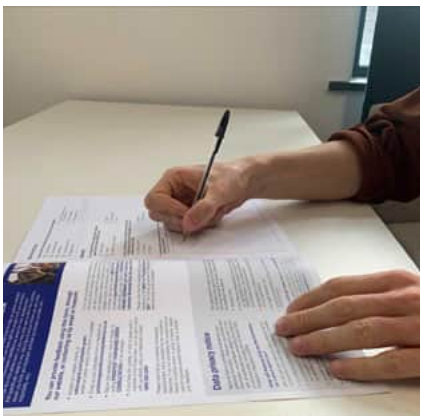
A recording of the first Project Overview webinar is also available on our website with accompanying British Sign Language interpretation.

Have your say

If you were unable to attend any of our 14 public information events or can't make any of our webinars, you can still take part and provide your feedback by:

Visiting our website

Visit **nationalgrid.com/norwich-to-tilbury** where you will find where you will find maps, technical documents, the Preliminary Environmental Information Report (PEIR) and our online feedback questionnaire. You can also access our latest interactive Project map.



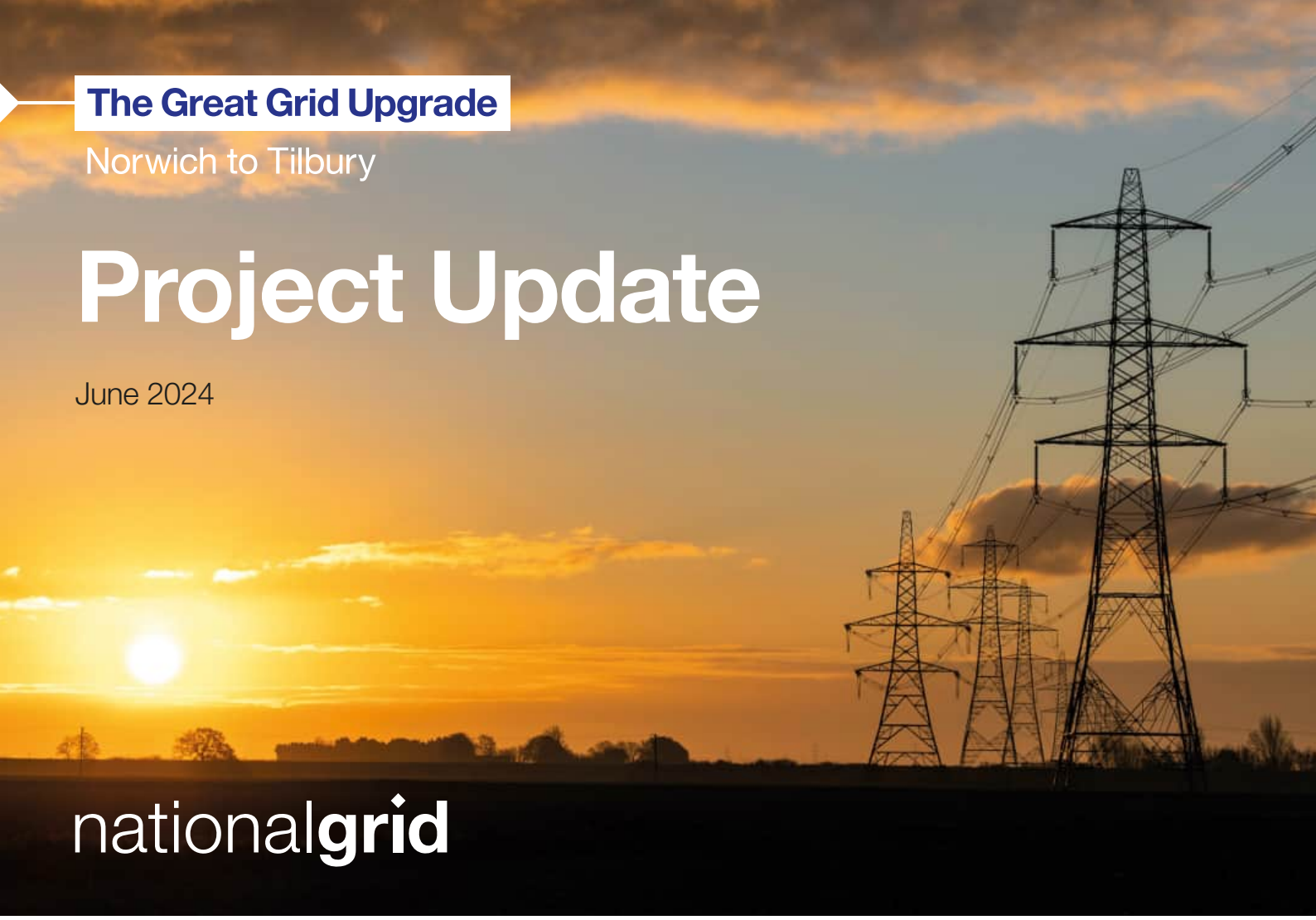
Completing a feedback questionnaire

Your feedback is important to us. You can submit your comments online through our Project website or by sending a feedback questionnaire or a letter to us by using our freepost address – Freepost N TO T. You can also submit your feedback via email to the Project email address – **contact@n-t.nationalgrid.com**.

Any feedback already submitted is still valid, but if anyone wants to submit any further feedback or comments, you can do so.

What happens after consultation closes?

Following the close of the statutory consultation, we will consider all the feedback submitted and, together with the findings from ongoing technical and environmental studies, we will finalise the details for the Project before submitting a Development Consent Order application to the Planning Inspectorate next year.



The Great Grid Upgrade

Norwich to Tilbury

Project Update

June 2024

nationalgrid

Less than one month to go to have your say on Norwich to Tilbury

We've extended our statutory consultation to give people additional time to have their say after the General Election. It will now close at 11.59pm on Friday 26 July 2024.

There's now less than one month to go until statutory consultation closes, and we're asking for your views on our proposals to upgrade the high voltage power network to connect new sources of offshore energy to the energy network.

Norwich to Tilbury will play a vital role in delivering electricity efficiently, reliably, and safely and will support the UK's move to reduce carbon emissions.

Since the start of the consultation on 10 April, we've held 14 public information events and one webinar, but there's still time to take part and have your say. If you were unable to attend our public information events, or our first webinar, you can still get involved and find out more.

Preliminary Environmental Information Report (PEIR) update

As part of this statutory consultation, we're consulting on the preliminary findings from our environmental studies and assessments as well as proposed mitigation for any potential impacts to the local environment, including animal habitats and the local landscape.

Since publishing the Preliminary Environmental Information Report (PEIR) and supporting figures, we've identified some pages where the edges of maps have been clipped. This doesn't affect the information contained within the PEIR or our assessments to date, but it does mean there are some small geographical gaps between map sections in some figures.

We've revised the relevant map sheets and have made these available on our **Project website** alongside an errata document.

Visit the Project website

You can find out more about our Project and the consultation on our Project website: **nationalgrid.com/norwich-to-tilbury**.

We have published technical documents including all maps, the Preliminary Environmental Information Report (PEIR) and our online feedback questionnaire. You can also access our latest interactive Project map.

Attend a consultation webinar

Join one of our digital information events by signing up on our **Project website**.
There are five webinars left, the details of which are:

Date and time	Topic
Wednesday 10 July 2024 6pm–7pm	Section A and B – South Norfolk and Mid Suffolk
Thursday 11 July 2024 6pm–7pm	Section C and D – Babergh, Tendring and Colchester
Tuesday 16 July 2024 6pm–7pm	Section E and F – Braintree and Chelmsford
Wednesday 17 July 2024 6pm–7pm	Section G and H – Basildon, Brentwood and Thurrock
Thursday 18 July 2024 6pm–7pm	Project Overview Two

You can also view a recording of our first Project Overview webinar on our **Project website**.

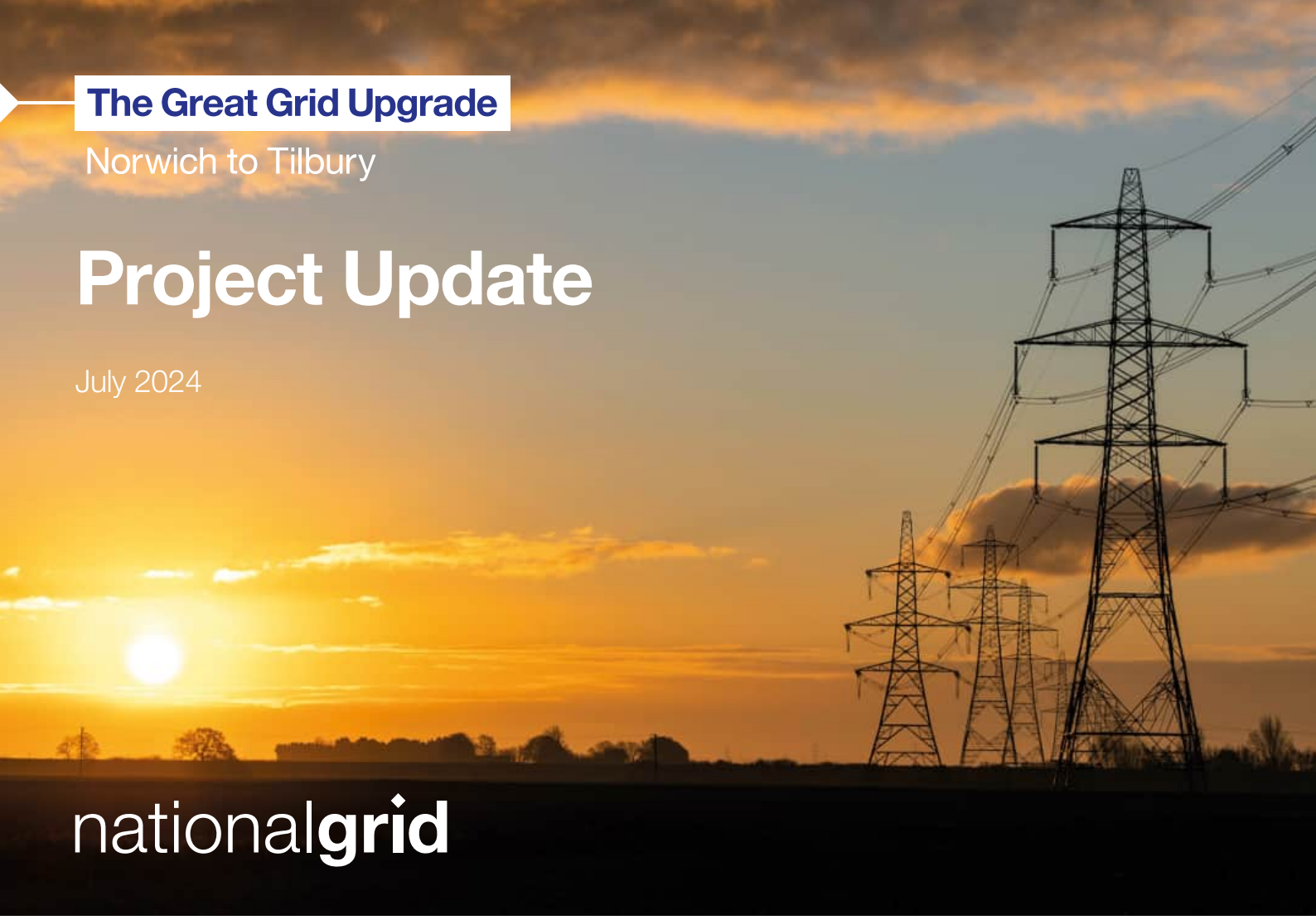
Complete an online feedback questionnaire

Your feedback is important to us. You can submit your comments online through our **Project website** or by sending a feedback questionnaire or a letter to us by using our freepost address – FREEPOST N to T.

You can also submit your feedback via email to the Project email address – **contact@n-t.nationalgrid.com**.

What happens after consultation closes?

Following the close of the statutory consultation, we will consider all the feedback submitted and, together with the findings from ongoing technical and environmental studies, we will finalise the details for the Project before submitting an application to the Planning Inspectorate next year.



The Great Grid Upgrade

Norwich to Tilbury

Project Update

July 2024

nationalgrid

One week to go to have your say on Norwich to Tilbury

Our statutory consultation for Norwich to Tilbury closes at 11.59pm on Friday 26 July 2024. There's still time to have your say and provide feedback on proposals to connect new sources of low carbon energy to the electricity network.

Since the start of consultation on 10 April, we've held 14 public events, two university events and six public webinars, and received thousands of pieces of feedback. Thank you to everyone who has taken part so far.

If you've not submitted your feedback or comments yet, there's still time to do so, and you can take part by visiting our website **nationalgrid.com/Norwich-tilbury** to find out more.

We want to make it as easy as possible for you to provide your feedback: you can use our online feedback questionnaire, email us or send a paper feedback questionnaire or letter to our Freepost address. Just remember to submit your feedback before **11.59pm on Friday 26 July 2024**.

Visiting our website

You can find out more about our Project and the consultation on our Project website: **nationalgrid.com/Norwich-tilbury**.

We have published technical documents including all maps, the Preliminary Environmental Information Report (PEIR) and our online feedback questionnaire. You can also access our latest interactive Project Map.



Completing a feedback questionnaire

Your feedback is important to us. You can submit your comments, express your support and share your views online through our Project website or by sending a feedback questionnaire to our freepost address – FREEPOST N to T.

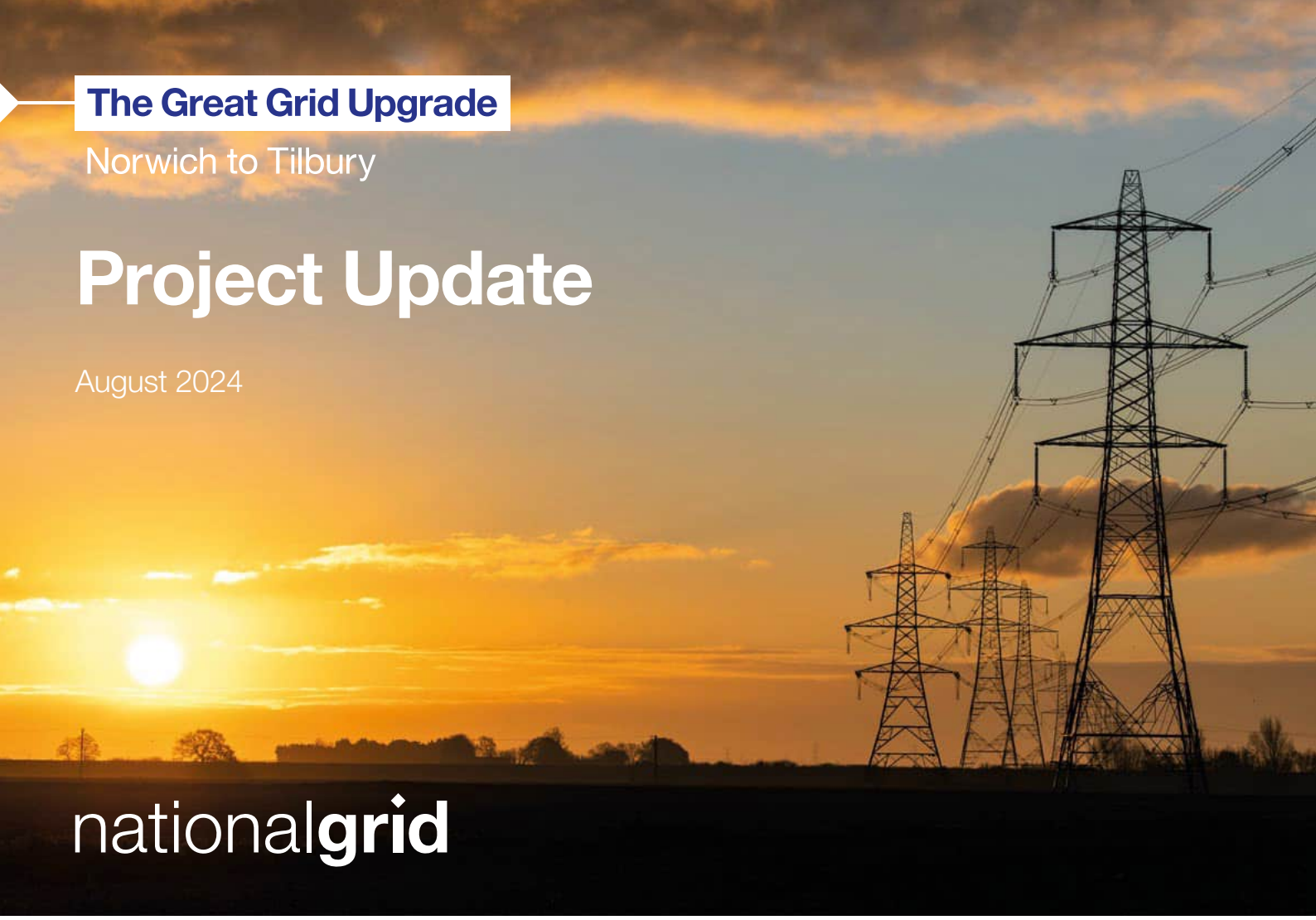
You can also submit your feedback via email to the Project email address – **contact@n-t.nationalgrid.com**.

Watch a consultation webinar

All our digital information events have now taken place, but you can view recordings of the presentations on our Project website.

What happens after the consultation?

Following the close of the statutory consultation, we will consider all the feedback submitted together with the findings from ongoing technical and environmental studies. We will finalise the details of our proposals and expect to submit an application to the Planning Inspectorate next year.



The Great Grid Upgrade

Norwich to Tilbury

Project Update

August 2024

nationalgrid

Consultation update

Our statutory consultation is now closed. Thank you to everyone who submitted feedback.

During the consultation we held 14 public information events, six webinars and received more than 10,000 pieces of feedback. We also held a series of briefings for local authority members, one webinar for younger audiences and pop-up events at universities in the region. We were pleased to welcome more than 2000 attendees at our events.

We are now carefully reviewing the feedback we received and carrying out further technical studies and environmental surveys. This will help us to refine our proposals ahead of the submission of our Development Consent Order (DCO) application next year.

We will continue to keep you up to date with Norwich to Tilbury, and don't forget you can still access all consultation materials – including the interactive map and webinar recordings – via the **Project website**.

What happens next?

Following the close of our statutory consultation, we are considering all the requests we have received to change aspects of our project and finalising our proposed design. We will let you know if there are any significant changes as a result of the feedback.

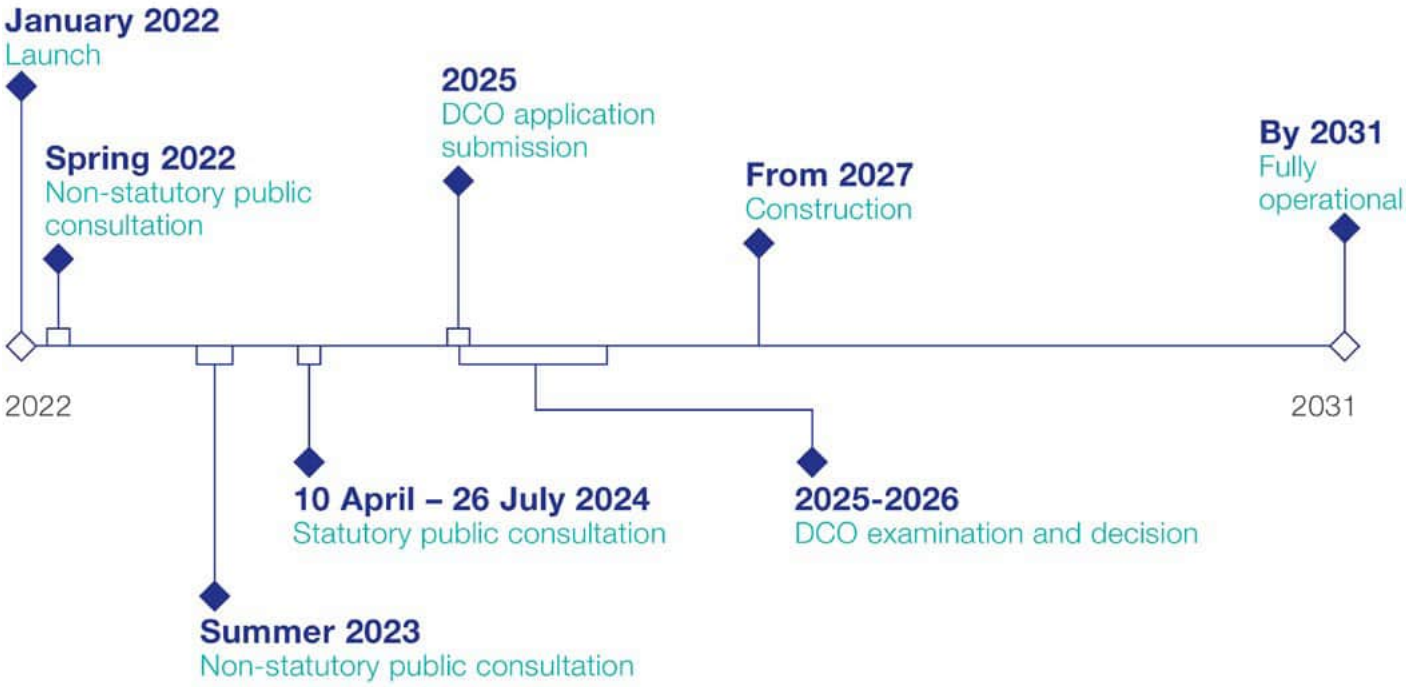
Over the next 12 months we will prepare an application for a Development Consent Order (DCO). When we submit our application, we will publish a Consultation Report which will set out how we have considered the feedback we received during statutory consultation.

Once the DCO application is submitted, the Planning Inspectorate on behalf of the Secretary of State, has up to 28 days to decide whether or not the application meets the standards required to be accepted for examination.

If the application is accepted, it will go through a six-month examination period. The Planning Inspectorate must then prepare a report on the application which they submit to the Secretary of State, along with a recommendation, within three months of the close of examination.

The Secretary of State has a further three months to make a decision on whether to grant or refuse development consent.

You can read more about the DCO process on our **Project website**.





Surveys

We are continuing to carry out technical and environmental surveys along the route and you might see some of our contractors at work.

The findings from our surveys will continue to inform decisions on the final routeing and siting of pylons and cables. They will also help us to plan how we might build the project and, in particular, how we might avoid, reduce or mitigate any construction impacts.

One area of particular focus is archaeology. We will carry out more geophysical archaeological surveys in September. We will use these to create maps of subsurface archaeological features to help us better understand where things might be buried under the ground. Our specialists will follow this with trial trenching surveys later this year.

Up to date information on all our current surveys and where they are taking place can be found **here**.

Norwich Main substation extension

Planning approval has been granted for an expansion of the Norwich Main electricity substation near Dunston.

The extension will allow new sources of offshore wind power generation from the Hornsea Project Three offshore wind farm, and the Equinor Sheringham Shoal and Dudgeon wind farm extensions to connect to the network.

[redacted] Consents Officer at National Grid, said: “Our existing substation at Norwich Main has been in service for around 50 years. We now need to extend the site to enable new sources of electricity generation to connect to the grid to power homes and businesses and help meet the government’s clean power targets”.

Construction work is expected to begin this September and complete in 2026. The Norwich Main project team will keep local residents updated.

Appendix I9

Letters to Non-Prescribed Consultees

Appendix I9.1

Consultation Launch

FREEPOST N TO T
T: 0800 915 2497
email: contact@n-t.nationalgrid.com
www.nationalgrid.com/n-t

Dear XXX

National Grid Electricity Transmission plc (National Grid) – Norwich to Tilbury

We are writing to inform you of the start of National Grid's statutory consultation for Norwich to Tilbury (the "Project"). We are contacting you as we believe you may be interested in our proposals.

The consultation starts at **12:00 noon on Wednesday 10 April 2024 and runs until 11:59pm on Tuesday 18 June 2024.**

The Project is a proposal by National Grid to upgrade the electricity transmission system in East Anglia between Norwich and Tilbury. The Project includes a new 400 kilovolt ("kV") electricity transmission connection of approximately 184 kilometres ("km") in overall length from Norwich Main Substation and Tilbury Substation via Bramford Substation, comprising:

- approximately 159 km of new overhead line supported on approximately 510 steel lattice pylons (approximately 50 metres ("m") in height) some of which are gantries (typically up to 15 m in height) within proposed Cable Sealing End ("CSE") compounds or existing or proposed substations
- approximately 25 km of 400 kV underground cabling some of which is located through the Dedham Vale National Landscape (formerly known as Dedham Vale AONB)
- six new CSE compounds, each with a permanent access, to connect the overhead lines to the underground cables
- a new 400 kV East Anglia Connection Node ("EACN") substation, with a new permanent access, on the Tendring Peninsula. This is proposed to be an Air Insulated Switchgear ("AIS") substation
- substation extension works at the existing Norwich Main and Bramford substations and works within the existing Tilbury Substation to connect and support operation of the new transmission connection
- temporary works associated with the construction of the Project.

An alternative design at the Waveney Valley (referred to as the Waveney Valley Alternative) is also being considered and is the subject of consultation and ongoing assessment. This design alternative, if taken forward, would result in changes to those elements of the Project set out below. This would instead comprise:

- installation of approximately 157 km of new 400 kV overhead line
- installation of approximately 27 km of 400 kV underground cabling (some of which is located through the Dedham Vale National Landscape)
- eight new CSE compounds (each with a permanent access) to connect the overhead lines to the underground cables.

All other works not listed above would be consistent with either alternative.

In other words, the Waveney Valley Alternative, if taken forward and based on the 2024 preferred draft alignment would comprise approximately 2 km less new 400 kV overhead line and approximately an additional 2 km of 400kV underground cabling and two additional new CSE compounds, each with a permanent access, to connect the overhead lines to the underground cables.

Third party utilities diversions and / or modifications would also be required to facilitate the construction of the Project. There would also be land required for mitigation, compensation and enhancement of the environment including Biodiversity Net Gain.

As well as the permanent infrastructure, land would also be required temporarily for construction activities including for example working areas for construction equipment and machinery, site offices, welfare, storage and temporary construction access.

Norwich to Tilbury will play a vital role in delivering electricity efficiently, reliably, and safely and will support the UK's move to reduce carbon emissions and we are committed to working with local communities as we develop our plans.

National Grid expects the Project to be classified as a Nationally Significant Infrastructure Project ("NSIP") and to require consent from the Secretary of State for Energy Security & Net Zero via a Development Consent Order ("DCO"). The development consent being sought will include a number of other provisions, including those which authorise the compulsory acquisition of land and rights over land, if necessary, to construct and maintain the Project.

Statutory consultation

The proposed Project is an Environmental Impact Assessment ("EIA") development, as defined by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) ("EIA Regulations"). As part of the consultation, we are seeking views on the potential environmental effects of the proposals and if consultees have suggestions for reducing these effects (for example, through mitigation measures). This information is detailed in the Preliminary Environmental Information Report ("PEIR"). An Environmental Statement will be prepared subsequently in accordance with the EIA Regulations and will accompany the application for development consent.

The Project is currently in the pre-application stage of the DCO application process. As such, the Project is consulting on its proposals between **12:00 noon on Wednesday 10 April and 11:59pm on Tuesday 18 June 2024**.

Supporting materials

National Grid (as required by the Planning Act 2008) has prepared a Statement of Community Consultation ("SoCC") which sets out how it will undertake the statutory consultation for the proposed application with those people living and working in the vicinity of the Project. The SoCC is available to view on the Project website: http://www.nationalgrid.com/n-t and at the inspection points listed further down in this letter.

A copy of the full suite of consultation documents is available to view on the Project website from **12:00 noon on Wednesday 10 April 2024 until 11:59pm on Tuesday 18 June 2024.**

These include:

- Project Background Document
- Community Newsletter 2024
- Feedback questionnaire
- Copy of the newspaper notice published under Section 48 of the Planning Act 2008 (as the Project is 'EIA Development' for the purposes of the EIA Regulations and as required by Regulation 4 of the Infrastructure Planning (Applications and Prescribed Forms and Procedure) Regulations 2009 (as amended))
- Preliminary Environmental Information Report ("PEIR") and non-technical summary ("NTS") of the PEIR
- Project maps/Project area maps showing the extent of the Project
- Statement of Community Consultation ("SoCC").

Copies of consultation materials and documents can be provided on request by contacting us either by email at contact@n-t.nationalgrid.com or by telephone 0800 915 2497.

Public information events

During the consultation a series of face-to-face public information events will be held where you can speak with the Project team.

You can attend any of our events to meet the Project team, ask questions and view more details of the Project:

Date and time	Venue

Wednesday 24 April 2024 12pm-5pm	Towngate Theatre, St Martin's Square, Basildon, Essex SS14 1DL
Thursday 25 April 2024 2pm-7pm	The Brentwood Centre, Doddinghurst Road, Pilgrims Hatch, Brentwood, CM15 9NN
Saturday 27 April 2024 11am-4pm	Chelmsford City Racecourse, Chelmsford, CM3 1QP
Tuesday 30 April 2024 12pm-5pm	Gislingham Village Hall, Mill Street, Gislingham, IP23 8JT
Wednesday 1 May 2024 11am-4pm	Copdock Village Hall, Old London Road, Copdock, IP8 3JN
Friday 3 May 2024 1pm-6pm	Needham Market Community Centre, School St, Needham Market, Ipswich IP6 8BB
Saturday 4 May 2024 11am-4pm	Lawford Venture Centre 2000, Bromley Road, Lawford, Manningtree CO11 2JE
Wednesday 8 May 2pm-7pm	The Civic Hall, Blackshots Lane, Grays, RM16 2JU
Thursday 9 May 2024 1pm-6pm	Thorpe Hall, Ashwell Thorpe and Fundenhall Community Centre, Muskett Road, Ashwellthorpe, NR16 1FD
Friday 10 May 2024 1pm-6pm	Tibenham Community Hall, Pristow Green Lane, Tibenham, Norwich NR16 1PX
Tuesday 14 May 2024 11am-4pm	Witham Public Hall, Collingwood Road, Witham, CM8 2DY
Wednesday 15 May 2024 1pm-6pm	Diss Town Football Club, Diss, IP22 4QP
Thursday 16 May 2024 2pm-7pm	Langham Community Centre, School Road, Langham, Colchester, CO4 5PA
Friday 17 May 2024 1pm-6pm	Great Bromley Village Hall, Parsons Hill, Great Bromley, Colchester, CO7 7JA

Printed copies onf the consultation materials will be made available at consultation events for attendees to review. Attendees will also be able to take away copies of the Project Background Document and Feedback questionnaire.

In addition to being available online, the Community Newsletter, Project Background Document, non-technical summary ("NTS") of the Preliminary Environmental Information Report ("PEIR"), Statement of Community Consultation ("SoCC") and Feedback questionnaire will be available to view free of charge at the following inspection points throughout the consultation period.

Location	**Address**	**Opening hours**
Long Stratton Library	The Street Long Stratton NR15 2XJ	Monday - 11am-7pm Tuesdays - 1pm-7pm Wednesday - 8am-7pm (unstaffed) Thursday - 1pm-7pm Friday - 8am-7pm (unstaffed) Saturday - 11am-4pm Sunday - 10am-4pm (unstaffed).
Norwich Library	Unit 3 The Forum Millenium Plain Norwich	Monday - Friday - 10am-7pm Saturday - 9am-5pm

	NR2 1AW	
Tuckswood Library	Robin Hood Road Eaton NR4 6BX	Monday - 8am – 7pm (unstaffed) Tuesday - 11am-7pm Wednesday - 8am-7pm (unstaffed) Thursday - 8am-7pm (unstaffed) Friday - 11am-7pm Saturday - 10am-4pm Sunday - 10am-4pm (unstaffed).
Diss Library	Church Street Diss IP22 4DD	Monday - 10am-7pm Tuesday - 8am-7pm Wednesday - 10am-7pm Thursday - 10am-7pm Friday - 10am-7pm Saturday - 10am-7pm Sunday - 10am-4pm
Stowmarket Library	Milton Road Stowmarket IP14 1EX	Monday - Closed Tuesday - 8.30am-6.45pm Wednesday - 8.30am-5.45pm Thursday - 8.30am-5.45pm Friday - 8.30am-6.30pm Saturday - 8.30am-4pm Sunday - 10am-4pm.
Capel St Mary Library	Village Hall The Street Capel St Mary IP9 2EF	Monday - Closed Tuesday - 9am-12.30pm, 2pm-5.30pm Wednesday and Thursday - 9am-12.30pm Friday - 2pm-5.30pm Saturday - 9am-3pm Sunday - 10am-3pm.
Coggeshall Library	The Friends Meeting House Stoneham Street Coggeshall CO6 1UH	Monday - Closed Tuesday - 2pm-5.30pm Wednesday - Closed Thursday - 9am-5.30pm Friday - Closed Saturday - 9am-5pm Sunday - Closed.
Chelmsford Library	Market Road Chelmsford CM1 1QH	Monday - 9am-5.30pm Tuesday - 9am-5.30pm Wednesday - 9am-5.30pm Thursday - 9am-7pm Friday - 9am-5.30pm Saturday - 9am-5pm Sunday - 10.30am-1.30pm
Colchester Library	Trinity Square Colchester CO1 1JB	Monday - 9am-5.30pm Tuesday - 9am-5.30pm Wednesday - 9am-7pm Thursday - 9am-5.30pm Friday - 9am-5.30pm Saturday - 9am-5pm Sunday - 1pm-4pm
Tilbury Library	Civic Square Tilbury	Monday - 10am-1pm and 2pm-5pm Tuesday - Closed

	RM18 8AD	Wednesday - 10am-1pm and 2pm-5pm Thursday - Sunday - Closed
Greenstead Library	Hawthorn Avenue Colchester CO4 3QE	Monday - 9am-5.30pm Tuesday - 9am-5.30pm Wednesday - Closed Thursday - 9am-5.30pm Friday - Closed Saturday - 9am-5pm Sunday - Closed
Stanway Library	10 Villa Road Stanway CO3 0RH	Monday - Closed Tuesday - 2pm-7pm Wednesday - Closed Thursday - 9am-1pm Friday - Closed Saturday - 9am-1pm Sunday - Closed
Prettygate Library	Prettygate Road Colchester CO3 4EQ	Monday - Closed Tuesday - 9am-7pm Wednesday - 9am-5.30pm Thursday - Closed Friday - 9am-5.30pm Saturday - 9am-5pm Sunday - Closed
Wivenhoe Library	104/6 High Street Wivenhoe CO7 9AB	Monday - Closed Tuesday - 2pm-7pm Wednesday - Closed Thursday - 9am-5.30pm Friday - Closed Saturday - 9am-5pm Sunday - Closed

Prior to attending these locations, it is advised opening times are checked.

In addition to the public information events, we will be holding six webinars, where members of the Project team will be available to answer questions. The dates and times of these sessions are as follows:

Date and time	**Webinar**
Wednesday 17 April 6pm-7pm	Project Overview One*
Wednesday 29 May 6pm-7pm	Section A and B - South Norfolk and Mid Suffolk
Thursday 30 May 6pm-7pm	Section C and D - Babergh, Tendring and Colchester
Wednesday 5 June 6pm-7pm	Section E and F – Braintree and Chelmsford
Thursday 6 June 6pm-7pm	Section G and H – Basildon, Brentwood and Thurrock
Wednesday 12 June 6pm-7pm	Project Overview Two

* A British Sign Language interpreter will be available.

You can register for a webinar by signing up on our Project website: http://www.nationalgrid.com/n-t.

Responding to the Consultation

Responses to this consultation must be received between **12:00 noon on Wednesday 10 April 2024 and 11:59pm on Tuesday 18 June 2024.**

Responses to this consultation can be submitted online at http://www.nationalgrid.com/n-t

Alternatively, you can return a printed copy of the Feedback questionnaire or a free text response via email: contact@n-t.nationalgrid.com or post: FREEPOST N TO T (please write this in capitals, you do not need a stamp).

Requests for paper copies of the technical documents will be reviewed on a case by-case basis. To cover printing costs a reasonable copying charge may apply, to be paid for by the recipient and up-to a maximum value of £500 for the whole suite of consultation documents. Please get in touch with us using the details below if you would like a printed or alternative format copy of materials.

Telephone: 0800 915 2497.

Email: contact@n-t.nationalgrid.com

Following the close of the consultation all feedback will be collated, reviewed and analysed to understand key themes and concerns. Our proposals will be reviewed and, where practicable, refined in light of feedback.

We may be required to make copies of representations available to the Secretary of State. However, we will request that personal details are not placed on the public record. Personal details will be held securely in accordance with the relevant data protection legislation and will be used solely in connection with the consultation process and the development of this Project and, except as noted above, will not be disclosed to any third parties. National Grid's privacy policy can be found on its website: www.nationalgrid.com/privacy-policy.

If you have any questions about the Project, please don't hesitate to contact us at the above freephone, freepost or email address.

We look forward to hearing from you.

Yours faithfully

[redacted]

Project Director

Appendix I9.2

Consultation Extension

FREEPOST N TO T

T: 0800 915 2497
email: contact@n-t.nationalgrid.com
www.nationalgrid.com/n-t

05 June 2024

Dear Sir / Madam

Statutory Consultation for Norwich to Tilbury: Consultation extended until 11:59pm on Friday 26 July 2024

National Grid Electricity Transmission plc ("National Grid") is writing to inform you of an extension to National Grid's statutory consultation for Norwich to Tilbury (the "Project"). National Grid is contacting you as you may be interested in its proposals.

The consultation started at **12:00 noon on Wednesday 10 April 2024 and will now run until 11:59pm on Friday 26 July 2024.**

National Grid is doing this to give the public, their representatives, landowners and stakeholders additional time and opportunity to have their say and provide feedback on our proposals after the forthcoming General Election.

Any feedback already submitted during this consultation remains valid, but if you wish to submit any further feedback, you can do so.

The Project is a proposal by National Grid to upgrade the electricity transmission system in East Anglia between Norwich and Tilbury. The Project includes a new 400 kilovolt ("kV") electricity transmission connection of approximately 184 kilometres ("km") in overall length from Norwich Main Substation and Tilbury Substation via Bramford Substation, comprising:

- approximately 159 km of new overhead line supported on approximately 510 steel lattice pylons (approximately 50 metres ("m") in height) some of which are gantries (typically up to 15 m in height) within proposed Cable Sealing End ("CSE") compounds, or existing or proposed substations
- approximately 25 km of 400 kV underground cabling some of which is located through the Dedham Vale National Landscape (formerly known as Dedham Vale AONB)
- six new CSE compounds, each with a permanent access, to connect the overhead lines to the underground cables
- a new 400 kV East Anglia Connection Node ("EACN") substation, with a new permanent access, on the Tendring Peninsula. This is proposed to be an Air Insulated Switchgear ("AIS") substation
- substation extension works at the existing Norwich Main, and Bramford substations and works within the existing Tilbury Substation to connect and support operation of the new transmission connection
- temporary works associated with the construction of the Project.

An alternative design at the Waveney Valley (referred to as the Waveney Valley Alternative) is also being considered and is the subject of consultation and ongoing assessment. This design alternative, if taken forward, would result in changes to those elements of the Project set out below. This would instead comprise:

- installation of approximately 157 km of new 400 kV overhead line.
- installation of approximately 27 km of 400 kV underground cabling (some of which is located through the Dedham Vale National Landscape).
- eight new CSE compounds (each with a permanent access) to connect the overhead lines to the underground cables.

All other works not listed above would be consistent with either alternative.

In other words, the Waveney Valley Alternative, if taken forward and based on the 2024 preferred draft alignment would comprise approximately 2 km less new 400 kV overhead line and approximately an additional 2 km of 400kV underground cabling and two additional new CSE compounds, each with a permanent access, to connect the overhead lines to the underground cables.

Third party utilities diversions and / or modifications would also be required to facilitate the construction of the Project. There would also be land required for mitigation, compensation and enhancement of the environment including Biodiversity Net Gain.

As well as the permanent infrastructure, land would also be required temporarily for construction activities including, for example, working areas for construction equipment and machinery, site offices, welfare, storage and temporary construction access.

Norwich to Tilbury will play a vital role in delivering electricity efficiently, reliably, and safely and will support the UK's move to reduce carbon emissions and we are committed to working with local communities as we develop our plans.

National Grid expects the Project to be classified as a Nationally Significant Infrastructure Project ("NSIP") and to require consent from the Secretary of State for Energy Security & Net Zero via a Development Consent Order ("DCO"). The development consent being sought will include a number of other provisions, including those which authorise the compulsory acquisition of land and rights over land, if necessary, to construct and maintain the Project.

Statutory consultation

The Project is an Environmental Impact Assessment ("EIA") development, as defined by the EIA Regulations. As part of the consultation, we are seeking views on the potential environmental effects of the proposals and if consultees have suggestions for reducing these effects (for example, through mitigation measures). This information is detailed in the Preliminary Environmental Information Report ("PEIR"). An Environmental Statement will be prepared subsequently in accordance with the EIA Regulations and will accompany the application for development consent.

The Project is currently in the pre-application stage of the DCO application process. As such, the Project is consulting on its proposals **until 11:59pm on Friday 26 July 2024.**

Consultation documents

National Grid (as required by the Planning Act 2008) has prepared a Statement of Community Consultation ("SoCC") which sets out how National Grid will undertake the statutory consultation for the proposed application with those people living and working in the vicinity of the Project. The SoCC is available to view on the Project website: http://www.nationalgrid.com/n-t and at the inspection points listed further down in this email.

A copy of the full suite of consultation documents is available to view on the Project website **until 11:59pm on Friday 26 July.** These include:

- Project Background Document
- Feedback questionnaire
- Copy of the newspaper notice published under Section 48 of the Planning Act 2008 (as the Project is 'EIA Development' for the purposes of the EIA Regulations and as required by Regulation 4 of the Infrastructure Planning (Applications and Prescribed Forms and Procedure) Regulations 2009
- Preliminary Environmental Information Report ("PEIR") and non-technical summary ("NTS") of the PEIR
- Project maps/Project area maps showing the extent of the Project
- Statement of Community Consultation ("SoCC").

Appendix I10

Non-Prescribed Consultee List

Non-Prescribed Consultee List

Consultee	Responded to the Statutory Consultation Y or N
Hard to Reach (HTR) Groups	
The Bank Arts Centre	Y
Sport England	Y
The Bridge Plus	N
Norfolk and Suffolk Gypsy, Roma and Traveller service	N
Carers Matter Norfolk	N
Norfolk Carers Support	N
Active Norfolk	N
Down's Syndrome for Norfolk	N
Carers Voice Norfolk	N
Elevate	N
Equal Lives	N
The Benjamin Foundation	N
Hamlet Centre Trust	N
Mid Norfolk Group of Riding for the Disabled (RDA)	N
Musical Keys	N
Nancy Oldfield Trust	N
Norfolk SEND (Special Education Needs and/or Disabilities) Association (Nansa)	N
Norfolk and Waveney Mind	N
Voluntary Norfolk	N
Healthwatch Norfolk	N
Under 1 Roof	N
Norwich Access Group	N
Norfolk Deaf Association	N
Norfolk Fibromyalgia Support	N
Vision Norfolk	N
West Norfolk Disability Information Service	N
Age UK Norfolk	N
Women's Institute (WI) Norfolk	N

Consultee	Responded to the Statutory Consultation Y or N
The Workers' Education Association	N
University of the Third Age	N
Career Transition Partnership	N
Talent Match	N
Broadland Group	N
Emmanus Norfolk and Waveney	N
Norfolk Integrated Housing and Community Support Service	N
Pathways Norwich	N
Shelter Norwich	N
Solo Housing	N
St Martins Housing Trust	N
The Purfleet Trust	N
Victory Housing	N
Diocese of Norwich Education and Academies Trust	N
Norfolk County Council adult learning service (ESOL)	N
Round Up Magazine	N
Norfolk Dragons Handball Club	N
Norfolk Nordic Walking	N
Norfolk Trails	N
Norfolk Wayfarers	N
Norwich Pickleball Club	N
Teachers Junior Badminton Club	N
Visit East Anglia Tourist Information Centre	N
Visit Norfolk	N
Norfolk and Suffolk Gypsy and Traveller Service	N
Norfolk Community Foundation	N
BUILD Norfolk	N
Equal Lives	N
Autism Anglia	N
Norfolk Historic Buildings Trust	N
Citizens Advice Norwich	N

Consultee	Responded to the Statutory Consultation Y or N
MAP Norfolk	N
Norwich Institute for Language Education	N
Norwich Study Centre	N
Citizens Advice Great Yarnmouth	N
Citizens Advice Kings Lynn	N
EP Youth Norfolk	N
OPEN Youth Trust (OPEN) Norfolk	N
Norfolk Youth Parliament	N
Norfolk Youth Advisory Board	N
15th Norwich Air Scout Group	N
Young Men's Christian Association (YMCA) Norfolk	N
16th Norwich Sea Scouts	N
18th Norwich Scout Group	N
19th Kings Lynn Scout Group	N
1st Diss Scout Group	N
1st Downham Market Scout Group	N
1st Norwich Sea Scouts	N
Norfolk Federation of Young Farmers' Clubs & Countrysiders	N
One Suffolk	N
Norfolk and Suffolk Fly Fishers' Society	N
Yaxley House Care Home	N
Hartismere Place Care Home - Care UK	N
The Limes Retirement Home	N
The Blossom Charity	N
The Vine Church	N
Yaxley Community Centre	N
Suffolk Family Carers	N
St Mary Church, Yaxley	N
Ipswich Housing Association Group	N
LCF Ipswich	N
Ipswich and Suffolk Indian Association	N

Consultee	Responded to the Statutory Consultation Y or N
Suffolk Portuguese Community Health Support Project	N
Suffolk Refugee Support	N
Ipswich Outreach	N
Aspire Black Suffolk	N
Blac and Minority Ethnic (BME) Suffolk Support Group	N
Diocese Suffolk	N
Community Action Suffolk	N
Suffolk Coalition of Disabled People	N
Age UK Suffolk	N
Colchester Civic Society	N
Active Suffolk	N
Ipswich and Suffolk Council for Racial Equality	N
Ipswich and Suffolk Small Business Association	N
Suffolk Adult Learning Services	N
Suffolk Sight	N
Suffolk UK Youth Parliament	N
YMCA Ipswich	N
Visit Essex	N
Rainbow Services	N
Essex Community and Voluntary Organisations	N
Chelmsford Community Transport	N
Age Concern Chelmsford	N
Thurrock Coalition	N
Remap - Essex Central and South Group	N
Off the Streets	N
Thurrock Eastern European Community Group	N
Sanctus	N
Colchester Night Shelter	N
Beacon House	N
HARP Southend Homeless Charity	N
Cruse Social Group	N

Consultee	Responded to the Statutory Consultation Y or N
Uttlesford Community Hub Centre	N
Braintree Foyer	N
Hope House Essex	N
Michael Roberts Charitable Trust (MRCT)	N
Supporting, Nurturing and Partnering (SNAP) Charity	N
Adult Community Learning (ACL) Essex	N
English Path Essex	N
Anglo European School Essex	N
Business Opportunities for Physically Handicapped	N
Rowhedge Heritage Trust	N
Essex County Community Foundation	N
Hadhavering	N
Grapevine Essex	N
Essex Countywide Traveller Unit (ECTU)	N
Age UK Essex	N
Essex Cultural Diversity Project	N
Essex Blind Society	N
Vision Impairment Service	N
Essex Cares Limited (ECL) Braintree	N
Blind and Sight Impaired Society	N
Citizens Advice Witham	N
Essex Carer Support	N
Carers Choice	N
Action for Family Carers Maldon	N
Parkside Witham Youth Centre	N
Services for Young People	N
La Jolie Ronde Languages for Children	N
Essex Boys and Girls Club	N
Young Assembly Essex	N
Thurrock Youth Cabinet	N
YMCA Chelmsford	N

Consultee	Responded to the Statutory Consultation Y or N
YMCA Colchester	N
Southend Youth Council	N
Equal Lives (covers Norfolk and Suffolk and for some projects, East Anglia)	N
Shelter, Eastern Counties (Norfolk, Suffolk, Essex)	N
The Centre for Renewable Energy Systems Technology	N
Renewable Energy Systems	N
Technology	N
Catapult Offshore Renewable Energy	N
The Carbon Trust	N
The Centre for Sustainable Energy	N
UK Climate Change	N
Impacts Programme	N
Environmental Change Institute	N
Renewable Energy Association	N
Ace Anglia	N
Friends, Families and Travellers	N
Home Builders Federation	N
Mineral Products Association	N
East Anglian Driveability	N
Disability Chair East of England	N
Disability Rights UK	N
Communities Together East Anglia	N
Care for Carers East Anglia	N
Good Things Foundation	N
Shelter	N
BME Youth	N
BAME Hub	N
Campaign Groups	
OffSet	Y
Essex Suffolk Norfolk Pylons Group (ESNP)	Y

Consultee	Responded to the Statutory Consultation Y or N
Campaign to Protect Rural England's (CPRE) 'Vision for Norfolk' committee	N
Suffolk Energy Action Solutions	N
Stour Valley Undergrounding	N
Community Action Norfolk	N
Community Groups	
Norfolk Gliding Club	Y
Churches Conservation Trust	Y
Bulphan Village Community Forum	Y
Stowmarket Ramblers	N
Bramford Open Spaces	N
Gipping Riding Society	N
East Bergholt Horticultural Society	N
Capel St Mary Parish Neighbourhood Plan	N
Aldham Neighbourhood Plan	N
Bentley Neighbourhood Plan	N
East Bergholt Neighbourhood Plan	N
Elmsett Neighbourhood Plan	N
Sproughton Neighbourhood Plan	N
Elmswild	N
Needham Market and District Horticultural Society	N
Bentley Riding School	N
Stowmarket Wildlife Group	N
Suffolk Area Ramblers	N
Suffolk Rambling Club	N
Basildon Greenway Ramblers	N
Brentwood Ramblers	N
Chelmer and Blackwater Ramblers	N
Colchester Ramblers	N
Aveley and Kenningtons Community Forum	N
Belhus and Ockendon Community Forum	N
Chadwell St Mary Community Forum	N

Consultee	Responded to the Statutory Consultation Y or N
Corringham, Fobbing and Homesteads Community Forum	N
Horndon Community Forum	N
Little Thurrock Community Forum	N
Orchards Community Forum	N
Orsett Community Forum	N
Purfleet-on-Thames Community Forum	N
Stanford Community Forum	N
Thameside Forum	N
Tilbury Community Forum	N
West Thurrock and South Stifford Community Forum	N
West Tilbury, East Tilbury and Linford Community Forum (WELCOM)	N
Business	
Suffolk Chamber of Commerce	Y
Essex Place Services	Y
Norfolk Chambers of Commerce	N
Norfolk Junior Chamber	N
Suffolk Growth Partnership	N
Suffolk Young Chamber	N
South East Local Enterprise Partnership	N
Essex Chambers of Commerce	N
Liftshare	N
The Energy Hub	N
New Anglia Local Enterprise Partnership	N
East of England Confederation of British Industry (CBI)	N
New Anglia Growth Hub	N
TechEast	N
New Anglia Local Enterprise Partnership Norwich	N
New Anglia Local Enterprise Partnership Suffolk	N
Environment	
South East Local Enterprise Partnership	N

Consultee	Responded to the Statutory Consultation Y or N
Natural England Norfolk (and Suffolk)	Y
CPRE Norfolk	Y
Forestry Commission - East & East Midlands Area	Y
Cycling UK (Bike Week)	Y
Natural England Suffolk (and Norfolk)	Y
Suffolk Coastal Friends of the Earth	Y
Ipswich Friends of the Earth	Y
Suffolk CPRE	Y
Suffolk Preservation Society	Y
Essex Wildlife Trust	Y
Natural England West Anglia	Y
National Farmers' Union (NFU) HQ	Y
Suffolk Wildlife Trust	Y
Friends of the Earth	Y
NFU	N
Norfolk Wildlife Trust	N
Norfolk Coast Partnership	N
Norfolk Biodiversity Partnership	N
Norwich Preservation Trust	N
Norfolk Rivers Trust	N
Norfolk Groundwork	N
Environmental Change Institute	N
Breckland Wildlife Trust	N
Broadland Wildlife Trust	N
Bure Valley Conservation Group	N
Climate Hope Action in Norfolk	N
Norfolk Biodiversity Partnership	N
Norfolk Coast Partnership	N
Norfolk Conservation Corps	N
Norfolk Plant Heritage Group	N
Norwich Bat Group	N

Consultee	Responded to the Statutory Consultation Y or N
Norwich Environmental Weekenders	N
Norwich Farming & Wildlife Advisory Group (FWAG)	N
The Conservation Volunteers	N
Earth Day	N
Plantlife/No Mow May	N
World Bee Day	N
World Environment Day	N
World Oceans Day	N
Zero Waste Europe	N
World Nature Conservation Day (World Wildlife Fund (WWF))	N
Great British Beach Clean (Marine Conservation Society)	N
Recycle Week Campaign (RecycleNow)	N
Unblocktober	N
National Clean Air Day	N
World Soil Day	N
Vision for Change Norfolk	N
Day of the Girl Norwich	N
FoodCycle Norwich	N
Green New Deal Norwich	N
Norfolk Can Inspire	N
The Norwich Society	N
Sustainable Living Initiative Norwich	N
Grapes Hill Community Garden	N
Norwich Farmshare	N
Norwich FoodHub	N
Bee Saviour Behaviour	N
Wild Anglia	N
Norfolk Badger Trust	N
NFU Mutual Norfolk	N
Yaxley Lake, Quiet Sports Fishery Management	N

Consultee	Responded to the Statutory Consultation Y or N
Suffolk Groundwork	N
Suffolk FWAG	N
Suffolk Badgers and Other Mammals	N
Essex and Suffolk Rivers Trust	N
Essex Groundwork	N
Essex CPRE	N
Kent & Essex Inshore Fisheries & Conservation Authority	N
Essex Environment Trust	N
Basildon Natural History Society - Basildon District	N
Brentwood and Billericay Wildlife Trust Local Group - Brentwood and Billericay District	N
Chelmsford Wildlife Trust Local Group - Chelmsford District	N
South East Essex Friends of the Earth - Southend-on-Sea	N
The Conservation Volunteers in Essex	N
Repair Cafe/Repair Reuse Recycle Enterprise CIC - Chelmsford District	N
Cory Environmental Trust in Rochford	N
Cockaynes Wood Trust - Tendring District	N
Friends of Bridge End Gardens - Uttlesford District	N
Essex Rural Partnership	N
North East Essex Badger Group	N
Essex Badger Protection Group	N
Harlow Badger Group	N
NFU Essex	N
Hydrogen East	N
Environmental Defense Fund	N
The Conservation Volunteers (TCV)	N
NFU East Anglia Region	N
NFU Norfolk	N
NFU Suffolk	N

Consultee	Responded to the Statutory Consultation Y or N
Dedham Vale Area of Outstanding Natural Beauty (AONB)	N
Greenpeace	N
Green Alliance	N
Renewable Energy Systems	N
Catapult Offshore Renewable Energy	N
The Carbon Trust	N
UK Climate Change	N
Impacts Programme	N
Environmental Change Institute	N
Renewable Energy Association	N
Education	
Mason Trust	Y
University of East Anglia	N
Norwich University of the Arts	N
City College, Norwich	N
College of West Anglia	N
Diocese of Norwich Education and Academies Trust	N
University Technical College Norfolk	N
About with Friends	N
Aylsham High School	N
Break Charity	N
City College Norwich	N
Connects & Co	N
Integrate Youth for Christ	N
Litcham School	N
Mid-Norfolk Youth for Christ	N
Norfolk Young Farmers	N
Norfolk Youth Advisory Board	N
Norfolk Youth Basketball League	N
Norfolk Youth Parliament	N
Sea Cadets Norwich	N

Consultee	Responded to the Statutory Consultation Y or N
Social Friends Interacting and Enjoying Living Differently (FIELD) club	N
The Boys' Brigade - Norfolk Battalion	N
The Nicholas Hamond Academy, Swaffham	N
The Watton Youth Group	N
University of East Anglia Student Union	N
Job Centre Plus	N
Norfolk Community College	N
Norfolk Community Foundation	N
Educator Solutions	N
University of Suffolk	N
Suffolk New College	N
East Coast College	N
West Suffolk College	N
Mellis Primary School	N
Mulberry Bush Nursery	N
University of Essex	N
South Essex College	N
Writtle University College	N
USP College, Benfleet	N
New City College, Epping	N
Colchester Institute	N
Havering Adult College	N
Thurrock Adult Community College	N
Writtle College Students' Union	N
Colchester Institute Students' Union	N
Transport	
Garnons Farm Airstrip	Y
Boxted Airfield	Y
London Stansted Airport	Y
Thurrock Airfield	Y
Broomfield Hospital Helipad	Y

Consultee	Responded to the Statutory Consultation Y or N
Port of Tilbury	Y
Network Rail, Anglia	Y
Network Rail, Eastern Region	Y
Cycling UK	Y
General Aviation Awareness Council	Y
Active Travel England	Y
Sport England	Y
Norwich International Airport	N
Priory Farm Airstrip	N
Long Stratton Airstrip	N
South Norfolk Model Aircraft Club	N
Oaksmere Hotel	N
Old Buckenham Country Park	N
Norfolk Gliding Club	N
Brook Farm Airstrip	N
North Norfolk Community Transport	N
Raydon Wings Airfield	N
Nayland Airfield	N
Elmsett Airfield	N
Joint Helicopter Command (JHC) Flying Station Wattisham	N
Essex and Suffolk Gliding Club	N
Barnard Farm Airstrip	N
Brock Farm Airstrip	N
Laindon Airstrip	N
Chase Farm Aistrip	N
C2C	N
Dubai Port (DP) World	N
Port of London Authority	N
First Essex Buses	N
Essex Highways	N
Greater Anglia Rail	N

Consultee	Responded to the Statutory Consultation Y or N
Thameslink Great Northern	N
East Midlands Railway	N
Highways England East	N
Simarco International	N
Stagecoach Group Head Office	N
Freightliner Group	N
First Eastern Counties	N
Road Haulage Association	N
Logistics UK	N
Railfuture East Anglia	N
Railfuture London & South East, Eastern Division	N
Sustrans	N
East of England All-Party Parliamentary Group	N
Transport Planning Society	N
Brake	N
Campaign for Better Transport	N
Disabled Persons Transport Advisory Committee	N
Other possible model aircraft flying clubs	N
Royal Town Planning Institute (RTPI) East of England	N
NHS Mid and South Essex Integrated Care Board	N
NHS Norfolk and Waveney Integrated Care Board	N
NHS Suffolk and North East Essex Integrated Care Board	Y
NHS Mid and South Essex Health and Care System	N
NHS North East London Foundation Trust	N
Better Care Together Thurrock	N
NHS Business Services Authority	N
NHS Blood and Transplant	N
NHS Resolution	N
NHS Counter Fraud Authority (NHSCFA)	N

Appendix I11

Project Newsletter



The Great Grid Upgrade

Norwich to Tilbury

nationalgrid

Community newsletter

April 2024

Have your say on proposals for Norwich to Tilbury

New clean energy sources – particularly offshore wind – will soon be connecting into the East Anglian electricity network.

Ensuring this energy can reach homes, businesses and public services means we need to improve the infrastructure, which transports electricity from where it is generated to where it is needed.

National Grid needs to upgrade the high voltage power network in England to connect these new sources of offshore energy to the energy network. Norwich to Tilbury would add much-needed capacity, upgrading the electricity transmission network in East Anglia.

We are now consulting on these proposals, which include a new 400 kilovolt (kV) electricity transmission line, improvement work at existing substations (in Norfolk, Suffolk and Essex) and a new substation on the Tendring Peninsula in Essex.

Our plans are part of the biggest overhaul of our energy network in a generation, the Great Grid Upgrade, which will see significant investment and improvement in our energy infrastructure as we transition towards net zero and more sources of low carbon power are developed.

The Great Grid Upgrade will connect clean energy that's produced right here in the UK, increasing the self-sufficiency of our energy supplies.

After more than two years of development and listening to public feedback following two non-statutory public consultations in 2022 and 2023, we're now holding a statutory consultation.

Statutory consultation will run from Wednesday 10 April to Tuesday 18 June.

This consultation is an opportunity to see how the design of the Project has progressed and how previous feedback has been considered as we have developed our plans. It is your opportunity to have your say on our updated proposals.

The deadline for providing feedback is 11.59pm on Tuesday 18 June.

What is Norwich to Tilbury?

Norwich to Tilbury is a proposal for the development of new high voltage electricity infrastructure in East Anglia, including new overhead lines and underground cables, substation improvements and a new substation.

We need to develop the Project because the existing transmission network in East Anglia doesn't have sufficient capacity to manage the expected increase in offshore wind needing to connect in the coming years and beyond.

By developing the Project, we would be able to connect new sources of low carbon energy to homes and businesses across Britain and help reduce our reliance on fossil fuels. In doing so, it would play a key role in addressing the climate emergency and help achieve the UK's targets for net zero.

What are you consulting on?

Our latest proposals for Norwich to Tilbury include the preferred route for a new 400 kilovolt (kV) electricity connection, the siting of pylons, environmental impacts and mitigation, and a new 400 kV East Anglia Connection Node (EACN) substation on the Tendring Peninsula in Essex.

We're also looking for views and comments on our proposals for construction, including temporary access roads and tracks, compounds and temporary areas to store materials, vehicles and staff welfare facilities.

You can find more detail on our website (nationalgrid.com/norwich-to-tilbury).

During this consultation we are seeking views on our latest proposals for the Project, which include:

- the preferred draft alignment for a new 400 kV electricity transmission connection of around 184 km running from Norwich Main Substation to Tilbury Substation via Bramford Substation including approximately 159 km of new overhead line and approximately 25 km of underground cabling
- six new Cable Sealing End (CSE) compounds (where high-voltage underground cables join onto an overhead line) and associated permanent accesses
- a new East Anglia Connection Node (EACN) 400 kV substation, with a new permanent access on the Tendring Peninsula
- an alternative design at Waveney Valley, substituting approximately 2 km of pylons with underground cabling
- substation extension works at the existing Norwich Main and Bramford substations and works within the existing Tilbury Substation
- temporary works including access roads, tracks and compounds associated with the project's construction.

We are also consulting on the preliminary findings from our environmental studies and assessments as well as proposed mitigation.

Waveney Valley

In response to feedback from our previous consultation, we are consulting on proposals for an alternative design (in addition to proposals for an overhead line) at Waveney Valley.

This alternative would include the installation of approximately 2 km of underground cabling (and the substitution of 2 km of overhead lines from our proposals) and two CSE compounds (to join the high-voltage underground cables onto the overhead line) with associated access roads.

This would increase the number of CSE compounds from six to eight. While underground cabling would reduce landscape and visual, recreational amenity and heritage effects in the area, it would have an impact on ecology, archaeology and peat soils, and come at an additional cost.

We welcome feedback on both alternatives at this consultation.

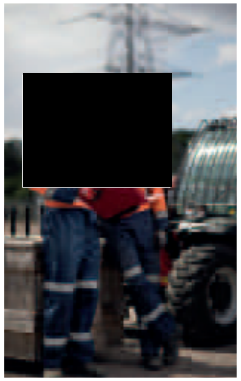


Temporary construction requirements

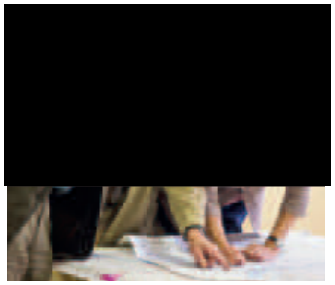
Building the project would involve a range of temporary construction activities.

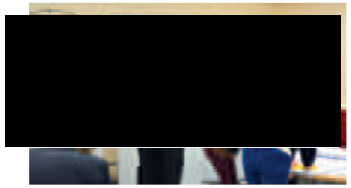
These would include preparing land and creating temporary haul roads to access work areas as well as providing temporary areas to store materials, vehicles and staff welfare facilities.

The Project order limits, otherwise known as the redline boundary, is the geographic extent of the Project. It is shown on the map which accompanies this newsletter and includes the areas proposed for construction. We welcome views and comments as part of the consultation.



What is statutory consultation?





The amount of overhead line in our current proposals means we expect Norwich to Tilbury to be classed as a Nationally Significant Infrastructure Project under the Planning Act 2008. This means we need to apply for a type of planning consent called a Development Consent Order (DCO) to build and operate it.

Consultation is an important part of the DCO process as it enables everyone to comment on the proposals.

Feedback, along with technical assessments and environmental surveys, helps to inform the development of the Project before we submit our DCO application to the Planning Inspectorate (PINS).

If our DCO application is accepted, PINS will appoint what is called an 'Examining Authority' to independently review and examine our application, including encouraging the submission of views from communities and other interested parties.

The Examining Authority will then make a recommendation to the Secretary of State for Energy Security and Net Zero, who will decide whether to grant consent for a DCO.

To find out more about the DCO process[1], please see the PINS website.

All feedback we receive as part of this latest consultation will be carefully considered as we finalise our proposals before submitting our DCO application.

This is our third public consultation on our proposals for Norwich to Tilbury. It is called a statutory consultation because it is being carried out in line with the formal requirements of the Planning Act 2008. It follows two previous non-statutory public consultations on our draft proposals which were held in 2022 and 2023.

[1] National Infrastructure Planning – the process, Planning Inspectorate infrastructure.planninginspectorate.gov.uk/application-process/the-process/

Why can't you build it offshore?

There is no fully offshore solution to connect offshore wind to the Grid and we have to bring the power onshore somewhere.

Our job is to carefully consider the most feasible options and present proposals for public consultation. In doing this, we must consider impacts on local communities and the environment and deliver value for electricity consumers.

We have assessed an equivalent offshore option and to deliver the same capacity as the overhead line, we would need to build three subsea cables and associated onshore infrastructure. This would mean significant extra cost to consumers, and that would not meet the requirement placed on us.

In addition to cost, there is a range of environmental considerations and other onshore and offshore impacts which would need to be taken into account when assessing this option. Taking all these considerations into account we have concluded that an onshore connection is the most appropriate solution.

Have you considered environmental impacts?

The Project is an Environmental Impact Assessment (EIA) development as defined by the EIA Regulations.

As part of the consultation, we are seeking views on the potential environmental effects of the proposals and whether consultees have suggestions for reducing these effects (for example, through mitigation measures). This information is detailed in the Preliminary Environmental Information Report (PEIR). An Environmental Statement (ES) will be prepared in accordance with the EIA Regulations and will accompany the application for a DCO.

We will also be required to ensure a 10 per cent biodiversity net gain (known as BNG). This means our work needs to result in more, or better quality, natural environment than before development. This opens up real opportunities to use development to enhance our wild spaces and provide new habitats.



Consultation materials

We encourage you to provide feedback having read our Project Background Document which outlines our proposals and early environmental studies.

More detailed information is available in our 2024 Design Development Report. The PEIR and a Non-Technical Summary (NTS) of the PEIR, as well as maps of our 2024 proposals, are available to view and download on our Project website along with an interactive map.

We have also published the 2023 Non-Statutory Consultation Feedback Report which sets out our responses to the feedback received during our last public consultation. All our consultation documents will be available to read at the public information events, listed on page 6.

Have your say

The statutory consultation runs from **Wednesday 10 April 2024 (12 noon) to Tuesday 18 June 2024 (11.59pm)**. You can take part in the consultation by:

Attending a public information event
come to one of our information events to view our proposals, speak to members of the Project team and read all the consultation materials, including our Project Background Document which outlines our proposals.

Attending a webinar
join one of our digital information events by signing up on our Project website.

Visiting our website
nationalgrid.com/norwich-to-tilbury where you will find all maps, technical documents, the PEIR, consultation materials and our online feedback questionnaire.

Please get in touch if you would like a paper copy of the feedback questionnaire, Project Background Document, or the non-technical summary (NTS) of the PEIR. These documents are also available to view at the inspection points listed in this newsletter.

Paper copies of the other consultation documents are also available on request.

Completing a feedback questionnaire
complete and return a feedback questionnaire to us. You can do this online through our Project website, in-person at a public information event, or by sending your feedback questionnaire or a letter to us by using our freepost address – **FREEPOST N TO T**. You can also submit your feedback via email to the Project email address – contact@n-t.nationalgrid.com.

The deadline for feedback is **11.59pm** on **Tuesday 18 June 2024**.

A reasonable charge may apply to cover printing and postage costs.

We have published a Statement of Community Consultation (SoCC), which sets out how we are carrying out this consultation. The SoCC was developed in consultation with relevant local authorities and is available on the Project website.

Public information events

We have selected event venues that are close to the proposed route. Larger event venues are highlighted with * where there will be more space to view displays and digital materials.

Date and time	Venue
Wednesday 24 April 2024 12-5pm	Towngate Theatre, St Martin's Square, Basildon, Essex SS14 1DL
Thursday 25 April 2024 2-7pm	The Brentwood Centre, Doddinghurst Road, Pilgrims Hatch, Brentwood CM15 9NN *
Saturday 27 April 2024 11am-4pm	Chelmsford City Racecourse, Chelmsford CM3 1QP *
Tuesday 30 April 2024 12-5pm	Gislingham Village Hall, Mill Street, Gislingham IP23 8JT
Wednesday 1 May 2024 11am-4pm	Copdock Village Hall, Old London Road, Copdock IP8 3JN
Friday 3 May 2024 1-6pm	Needham Market Community Centre, School St, Needham Market, Ipswich IP6 8BB
Saturday 4 May 2024 11am-4pm	Lawford Venture Centre 2000, Bromley Road, Lawford, Manningtree CO11 2JE
Wednesday 8 May 2-7pm	The Civic Hall, Blackshots Lane, Grays RM16 2JU *
Thursday 9 May 2024 1-6pm	Thorpe Hall, Ashwell Thorpe and Fundenhall Community Centre, Muskett Road, Ashwellthorpe NR16 1FD
Friday 10 May 2024 1-6pm	Tibenham Community Hall, Pristow Green Lane, Tibenham, Norwich NR16 1PX
Tuesday 14 May 2024 11am-4pm	Witham Public Hall, Collingwood Road, Witham CM8 2DY
Wednesday 15 May 2024 1-6pm	Diss Town Football Club, Diss IP22 4QP
Thursday 16 May 2024 2-7pm	Langham Community Centre, School Road, Langham, Colchester CO4 5PA
Friday 17 May 2024 1-6pm	Great Bromley Village Hall, Parsons Hill, Great Bromley, Colchester CO7 7JA

Webinars

Date and time	Topic
Wednesday 17 April 6-7pm	Project Overview One †
Wednesday 29 May 6-7pm	Section A and B – South Norfolk and Mid Suffolk
Thursday 30 May 6-7pm	Section C and D – Babergh, Tendring and Colchester
Wednesday 5 June 6-7pm	Section E and F – Braintree and Chelmsford
Thursday 6 June 6-7pm	Section G and H – Basildon, Brentwood and Thurrock
Wednesday 12 June 6-7pm	Project Overview Two

† A British Sign Language interpreter will be available

Inspection points

Information about Norwich to Tilbury is available to view and collect from the following locations from **Wednesday 10 April 2024**.

Location	Address
Long Stratton Library	The Street, Long Stratton NR15 2XJ
Norwich Library	Unit 3, The Forum, Millenium Plain, Norwich NR2 1AW
Tuckswood Library	Robin Hood Road, Eaton NR4 6BX
Diss Library	Church Street, Diss IP22 4DD
Stowmarket Library	Milton Road, Stowmarket IP14 1EX
Capel St Mary Library	Village Hall, The Street, Capel St Mary IP9 2EF
Coggeshall Library	The Friends Meeting House, Stoneham Street, Coggeshall CO6 1UH
Chelmsford Library	Market Road, Chelmsford CM1 1QH
Colchester Library	Trinity Square, Colchester CO1 1JB
Tilbury Library	Civic Square, Tilbury RM18 8AD
Greenstead Library	Hawthorn Avenue, Colchester CO4 3QE
Stanway Library	10 Villa Road, Stanway CO3 0RH
Prettygate Library	Prettygate Road, Colchester CO3 4EQ
Wivenhoe Library	104/6 High Street, Wivenhoe CO7 9AB

Inspection point opening hours can be subject to change. Please check with the relevant venue for the most up to date opening hours. Unstaffed hours require a library card for entry.

Contacted for the first time?

At this consultation we are presenting some new information.

This includes where – as a result of previous consultation feedback and environmental studies – we've made changes to the proposed routeing and siting of pylons, construction access, compounds, laydown areas and the traffic routes we propose to use during construction.

This means you may be hearing about Norwich to Tilbury for the first time. To find out how the Project may affect you, you can look at the map included with this newsletter or visit our online interactive map at: nationalgrid.com/norwich-to-tilbury or come to one of our events.



Landowners

If you feel your land may be affected by the proposals, please contact the Norwich to Tilbury Lands Team at Fisher German by emailing **Norwich-Tilbury@fishergerman.co.uk** or by calling us on Freephone **0808 175 3314**.

Alternatively, you can write to Norwich to Tilbury Lands Team at:
Fisher German, The Atrium, Risby Business Park, Newmarket Road, Risby, Bury St Edmunds, IP28 6RD

Useful links

- The Great Grid Upgrade: **nationalgrid.com/the-great-grid-upgrade**
- Norwich to Tilbury website: **nationalgrid.com/norwich-to-tilbury**
- Ofgem: **ofgem.gov.uk**
- Green Energy Network: **nationalgrid.com/electricity-transmission/what-if**

Contact us

If you would like to contact the community relations team, please get in touch via:

0800 915 2497
FREEPOST N TO T
contact@n-t.nationalgrid.com
nationalgrid.com/norwich-to-tilbury

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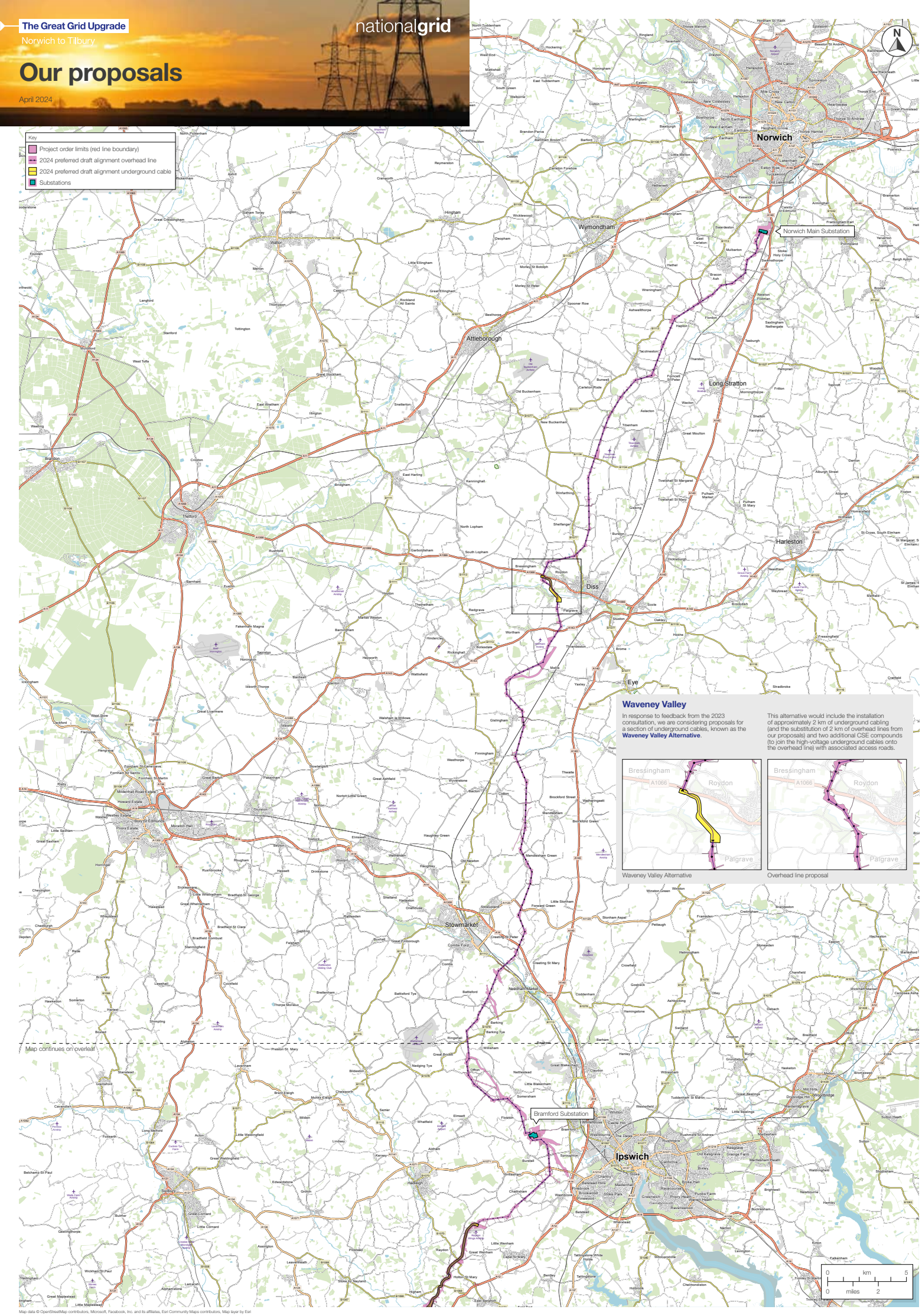
The Great Grid Upgrade

Norwich to Tilbury

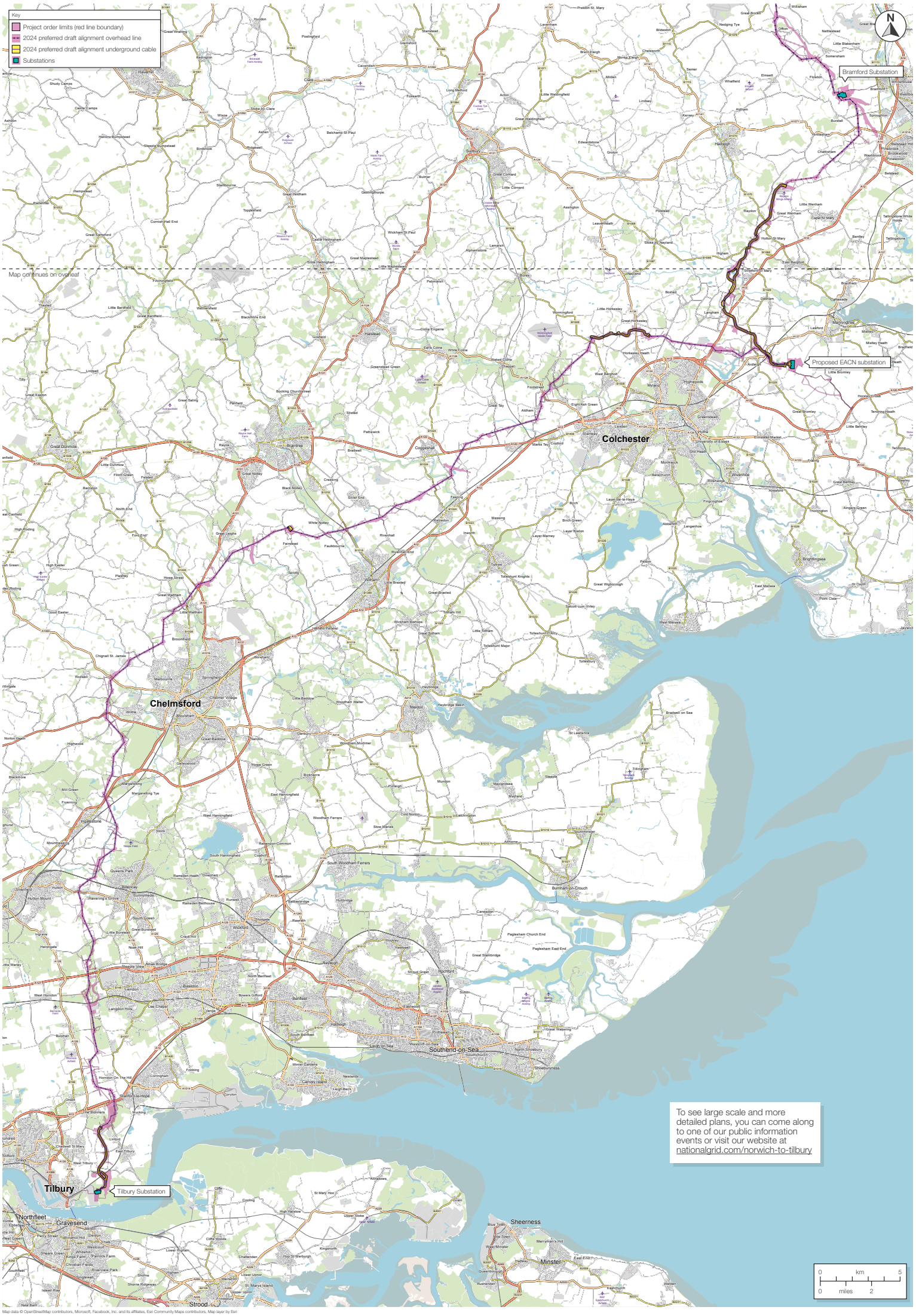
Our proposals

April 2024

nationalgrid



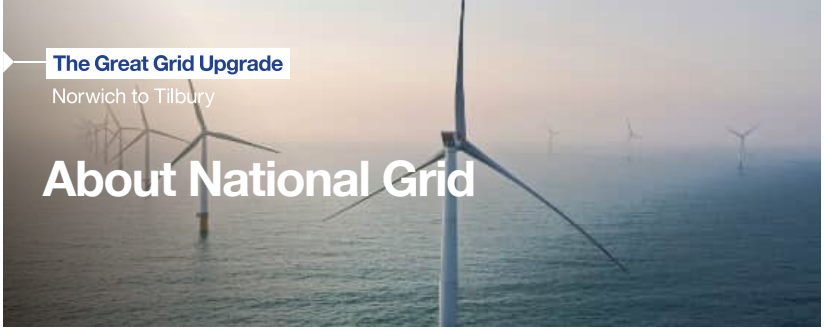
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Appendix I12

Project Banners



The Great Grid Upgrade

Norwich to Tilbury

About National Grid

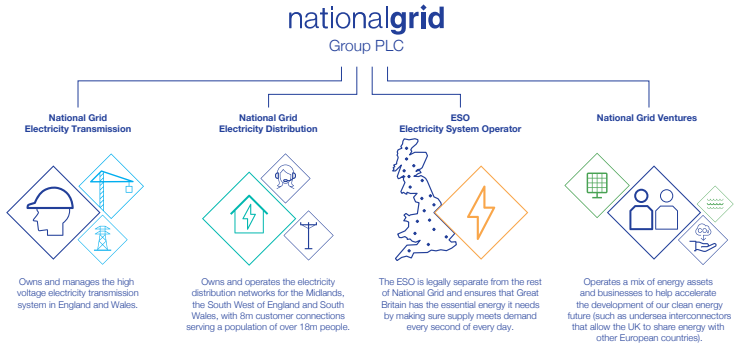
National Grid is working to build a cleaner, fairer and more affordable energy system that serves everyone, powering the future of our homes, transport and industry.

We sit at the heart of Britain's energy system, connecting millions of people and businesses to the energy they use every day.

We bring energy to life – in the heat, light and power we bring to our customer's homes and businesses; in the way that we support our communities and help them to grow; and in the way we show up in the world.

It is our vision to be at the heart of a clean, fair and affordable energy future.

Within the National Grid Group there are four separate legal entities, each with their individual responsibilities and roles. It is National Grid Electricity Transmission that is developing plans for Norwich to Tilbury.



nationalgrid.com



The Great Grid Upgrade

Norwich to Tilbury

The Great Grid Upgrade

The UK has set a world leading target to tackle climate change, which is to achieve net zero greenhouse gas emissions by 2050.

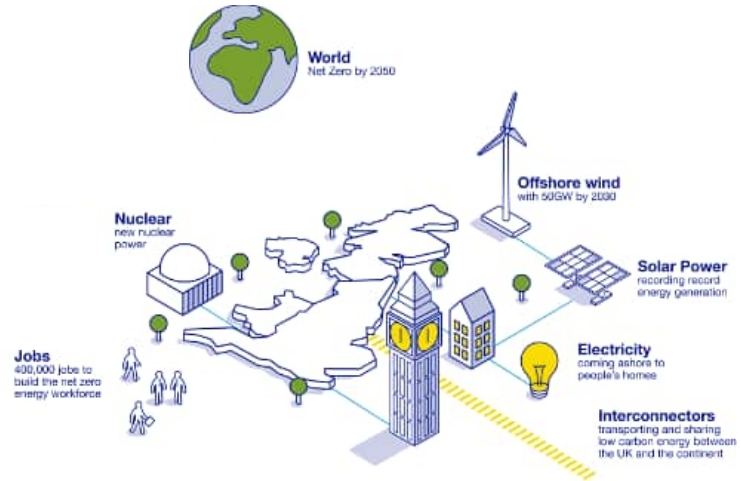
Put simply, this means that we will remove the same amount of greenhouse gas from the atmosphere as we produce.

The Great Grid Upgrade is the largest overhaul of the electricity grid in generations. Our infrastructure projects across England and Wales are helping to connect more renewable energy to your homes and businesses.

The Great Grid Upgrade will play a big part in the UK Government's plan to boost homegrown power. It will help the UK switch to clean energy and make sure our electricity network is fit for the future; carrying more clean, secure energy from where it's generated to where you need it.

Find out more about the Great Grid Upgrade here:

[redacted]



nationalgrid.com



The Great Grid Upgrade

Norwich to Tilbury

The Great Grid Upgrade in East Anglia

The way we generate electricity in the UK is changing rapidly, and we are transitioning to cheaper, cleaner and more secure forms of energy like new offshore windfarms.

We need to make changes to the network of overhead lines, pylons, cables and other infrastructure that transports electricity around the country, so that everyone has access to the clean electricity from these new renewable sources.

Along with Norwich to Tilbury, National Grid is developing a number of other projects in the region:

Sea Link

Sea Link is a proposed offshore link between Suffolk and Kent. We will consult on the latest proposals later this year.

Bramford to Twinstead

We are proposing to build a network reinforcement between Bramford Substation in Suffolk and Twinstead Tee in Essex. It is needed to resolve a bottleneck on the network. Building this new reinforcement will allow us to carry more power out to the west.

Our application for a Development Consent Order was accepted for examination by The Planning Inspectorate in May (2023).

Refurbishing the existing overhead line

We are carrying out essential work to refurbish the existing 400,000 volt (400 kV) overhead line that runs between our substations at Bramford and Norwich. This includes replacing all the fittings and wires between the existing pylons. This work will enable us to carry more power down the lines to homes and businesses where it is needed.

We started work in 2022 and expect to finish by the end of this year.

Extending Norwich Main Substation

We need to extend our existing substation to connect two new wind farms (Equinor's Sheringham Shoal and Dudgeon extensions and Orsted's Hornsea 3). We will publish more information when we have developed our plans in more detail.





The Great Grid Upgrade

Norwich to Tilbury

The Great Grid Upgrade - Norwich to Tilbury

We've changed the project name to Norwich to Tilbury because it is part of The Great Grid Upgrade.

All National Grid projects that are part of The Great Grid Upgrade will include locations in their names to make it easier for people to understand where we are proposing to build new grid infrastructure.

This new high voltage connection would run for approximately 183 km between existing substations at Norwich Main in Norfolk, Bramford in Suffolk, and Tilbury in Essex.

It would be made up mostly of overhead lines and pylons, along with some underground cables.

We also need to connect new offshore wind generation and are proposing to build to a new substation near Lawford on the Tendring Peninsula.

Since our 2022 consultation we have:

- carefully considered the consultation feedback and undertaken further assessments and technical work
- developed a preferred draft alignment which shows potential positions for pylons, overhead lines, underground cables and cable sealing end compounds
- developed our proposed preferred site for the new substation at Lawford.

Pylon design

Different designs in use in the UK include:

- standard lattice
- tower height lattice
- T-pylons.

For the purposes of this initial assessment, the preferred draft alignment presented in this consultation reflects the use of standard lattice pylons.

The use of other pylon designs is still under consideration and we will carry out further assessments as we develop our proposals further.



Standard lattice pylon



T-pylon



Lower height lattice pylon



The Great Grid Upgrade

Norwich to Tilbury

Why we need to build Norwich to Tilbury (1)

The high voltage electricity transmission network in East Anglia was developed in the 1960s to supply regional demand. Until now it has been able to meet this. But by the end of the decade the amount of renewable and low carbon energy connecting to the network is set to dramatically increase.

Figure 1 The existing high voltage transmission network in East Anglia





The Great Grid Upgrade

Norwich to Tilbury

Why we need to build Norwich to Tilbury (2)

The existing high voltage electricity network in East Anglia does not have sufficient capacity to accommodate new generation.

At present, the existing network in this area carries around 4,500 MW of electricity generation. Over the next decade we expect over 15,000 MW of new generation and 4,500 MW of new interconnection to connect in the region.

This includes:

- new offshore wind farms connecting into Necton and Norwich
- Five Estuaries and North Falls offshore wind farms: both currently in development off the east coast and expected to be in operation by 2030
- Tarchon Energy interconnector: 1,400 MW interconnector between UK and Germany, proposed to connect at the Tendring Peninsula.





The Great Grid Upgrade

Norwich to Tilbury

Government's review of offshore coordination

OTNR

The Government's Offshore Transmission Network Review (OTNR) is currently looking at how the offshore electricity transmission network can be delivered in a more coordinated way to deliver net zero emissions by 2050.

Norwich to Tilbury has been identified as 'essential' to deliver on the ambition of 50 GW of offshore wind by 2030.

HND

In summer 2022, National Grid ESO published the Holistic Network Design (HND) report, focusing on four key objectives:

- cost to consumer
- deliverability and operability
- impact on the environment
- impact on local communities.

The HND provided a recommended offshore and onshore design for a 2030 electricity network to help facilitate the Government's ambition for 50 GW of offshore wind by 2030.

OCSS

In December 2022, the Government announced the Offshore Coordination Support Scheme (OCSS). The OCSS will provide grant funding to projects to explore potential coordination options for offshore transmission infrastructure.

Applications closed in February 2023 and are currently being assessed by Government.

ASTI

Ofgem has introduced the Accelerated Strategic Transmission Investment (ASTI) framework to facility accelerated delivery of key strategic onshore transmission projects needed to deliver the Government's 2030 ambition. Under the framework, the Norwich to Tilbury project has been targeted with an optimal delivery date of 2030.

ESO Study

The Electricity Systems Operator (ESO) will carry out a 'Study' to assess objectively the options for Norwich to Tilbury and other proposed network reinforcements across East Anglia.

When the Study concludes, we will review our proposals in light of any recommendations.

There will be further consultation on proposals for Norwich to Tilbury, when we hope to show finalised proposals informed by both local feedback and the outcomes of the ESO Study.



The Great Grid Upgrade

Norwich to Tilbury

How our proposals have evolved

Feedback received from our 2022 public consultation has helped shape the development of our proposals.

After careful consideration of the feedback and taking into account further assessments, we have made changes to our proposals, both inside and outside of the 2022 preferred draft corridor.

More information on the changes and how we have progressed the project design since the 2022 public consultation is available in the Design Development Report 2023.

Changes outside the 2022 preferred draft corridor:

- diverting to the East of Wortham Ling before re-joining the preferred corridor to the south-west of Diss
- diverting to the east, south of Offton, then paralleling the existing 132 kV overhead line route to the north and east of Flowton to Bramford substation, referred to as North of Flowton
- an alternative route to the north and east of Notley Enterprise Park and at the northern edge of the Dedham Vale AONB, referred to as West of Great Wenham
- straightening the draft alignment slightly West of Writtle
- an alternative route further east of Ingatestone.

Areas where the preferred draft alignment would be routed within the preferred draft corridor presented in 2022:

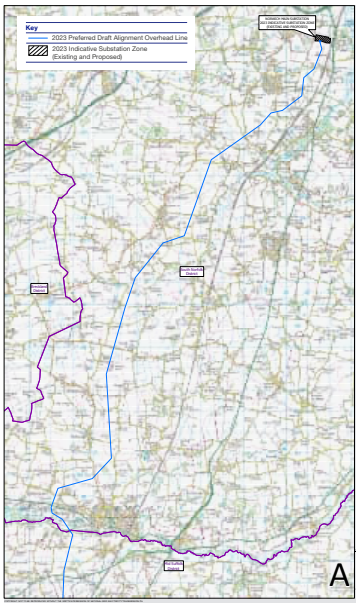
- broadly paralleling the existing 132 kV overhead line to the north-west of Barking and Barking Tye
- avoiding potential oversailing of properties and gardens at Aldham
- an alignment further east within the corridor south of Bramford near Burstall
- increasing the extent of underground cables from south of the Dedham Vale AONB through to the EACN. This also allows for an adjustment of the overhead line alignment near Ardleigh
- change of technology from overhead line to underground cable near Great Horkesley for a distance of approximately 5.3 km
- change of technology from overhead line to underground cable to cross under the existing 400 kV overhead line north of Fairstead
- passing to the east of Bushy Wood to increase distance from properties
- reduced interaction with the Dunton Hills Garden Village development by restricting the alignment to the eastern edge of the proposed corridor
- change of technology from overhead line to underground cable from the north of the Lower Thames Crossing proposals into Tilbury Substation.



The Great Grid Upgrade

Norwich to Tilbury

Our proposals in South Norfolk



Our plans in this section

The proposed reinforcement would start at Norwich Main substation in Norfolk. A new overhead line would run south from Norwich Main, running to the east of Mulbarton, Tacolneston and Shelfanger before routeing to the west of Roydon on the border with Mid Suffolk.

Changes since our 2022 consultation

Changes outside the 2022 preferred draft corridor

Changes East of Wortham Ling

West of Roydon and immediately south of the A1066, the alignment would diverge from the preferred draft corridor presented in 2022. The alignment would now turn to the east of Wortham Ling, before continuing into Section B.

Two new wind farms, Equinor's Sheringham Shoal and Dudgeon Extensions, and Orsted's Hornsea 3, are contracted to connect into Norwich Main over the next few years. To enable this we would need to extend the substation.



The Great Grid Upgrade

Norwich to Tilbury

Our proposals in Mid Suffolk



Our plans in this section

From the county boundary between South Norfolk and Mid Suffolk, the overhead line would run south, passing to the west of Mellis and to the east of Gislingham before crossing the railway.

The draft alignment would then continue south past Stowupland and Needham Market, where it crosses back over the railway, before it turns eastwards at Offton, runs north of Flowton and connects into Bramford substation.

From the substation, the overhead line would run south-east for a short distance to the border with Babergh.

Changes since our 2022 consultation

Changes outside the 2022 preferred draft corridor

East of Wortham Ling

The alignment would change to continue from the border between South Norfolk and Mid Suffolk and would run south, rejoining the 2022 preferred draft corridor east of Wortham.

North of Flowton

South of Offton, the alignment would run further east of the 2022 preferred draft corridor, south of Somersham and north of Flowton. This would broadly follow the route of the existing 132 kV overhead line that connects into Bramford substation.

Changes within the 2022 preferred draft corridor

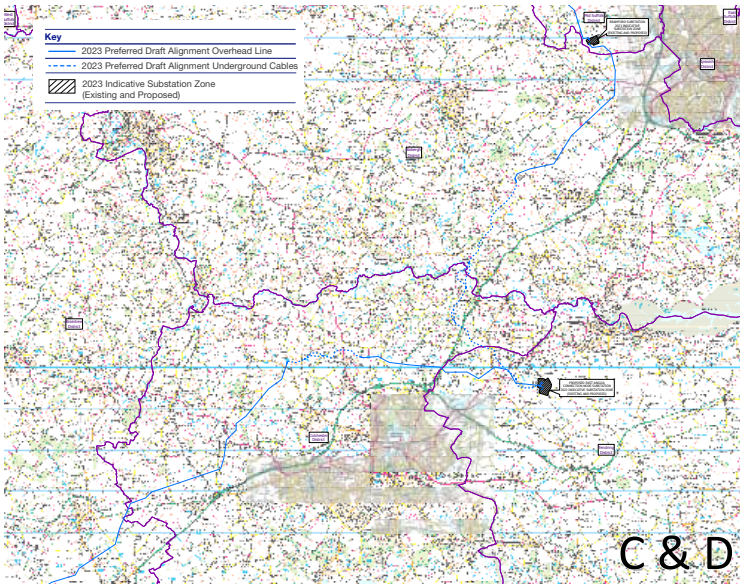
North-west of Barking and Barking Tye the preferred draft alignment would be routed within the preferred draft corridor presented in 2022 but in an area thought less likely as shown by the graduated swathe.



The Great Grid Upgrade

Norwich to Tilbury

Our proposals in Babergh, Tendring and Colchester (1)



Our plans for this section

The proposed draft overhead line alignment would cross immediately into Babergh from Bramford substation.

Running south-easterly, the route would pass to the west of Washbrook and Copdock and Little Wenham on the north side of Notley Enterprise Park.

We are proposing to build a cable sealing end compound (CSE) where the overhead lines would be joined to underground cables. From here underground cables would run to the east of Raydon and west of Holton St Mary. The underground cables would cross the border into the Colchester district briefly, running past the east of Langham and crossing the A12.

The underground cables would then cross eastwards into the Tendring Peninsula, passing the north of Ardleigh and crossing the railway to the site of the East Anglia Connection Node (EACN) substation.

From the EACN, we are proposing to build an overhead line heading west towards Great Horkesley, transitioning again to underground cable at a CSE compound. The underground cable alignment is expected to require a split corridor arrangement to the south of Knowles' Farm before reaching another CSE compound to the west of Crabtree Lane, where the underground cable would transition to overhead line.

From here, the overhead line would continue south-west, passing to the west of West Bergholt before crossing the A12, running north of Marks Tey into Braintree.

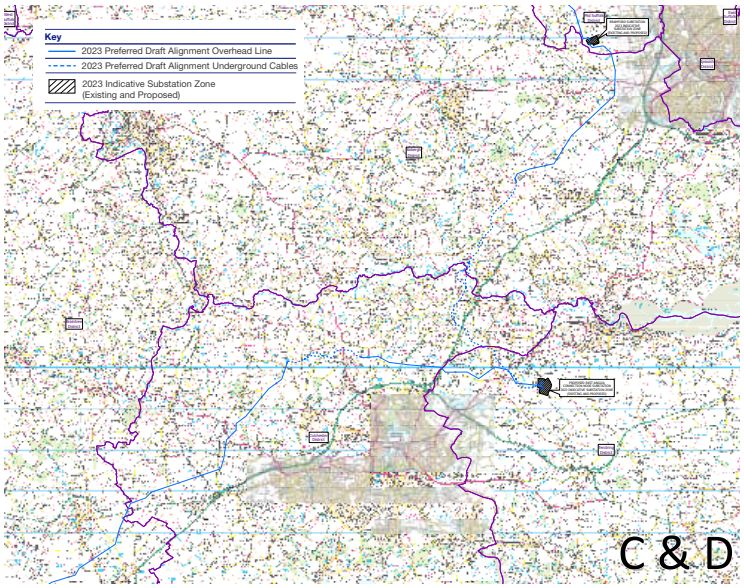
We are proposing to use underground cables as we cross the designated Dedham Vale AONB.



The Great Grid Upgrade

Norwich to Tilbury

Our proposals in Babergh, Tendring and Colchester (2)



Changes since our 2022 consultation

Changes outside the 2022 preferred draft corridor

West of Great Wenham

Instead of passing directly south between Great Wenham and Capel St Mary, the alignment would separate from the 2022 preferred corridor north of Little Wenham, running to the west of Great Wenham.

Changes within the 2022 preferred draft corridor

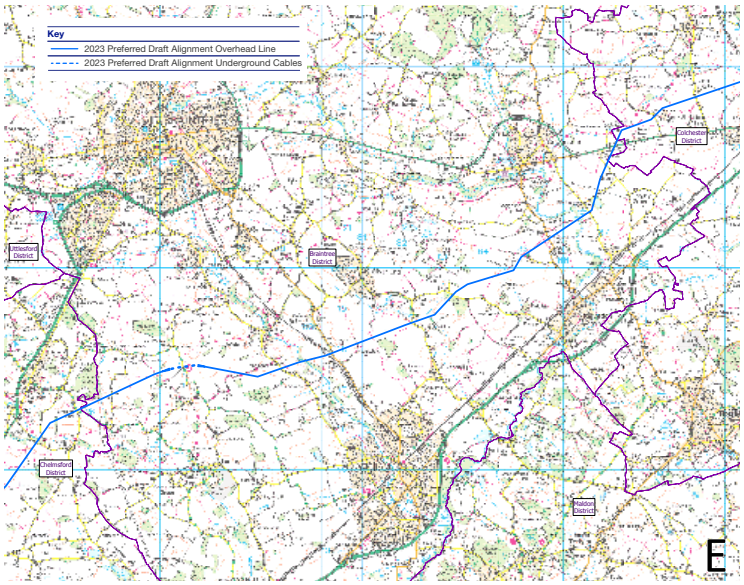
There are four further changes where the preferred draft alignment would be routed within the preferred draft corridor presented in 2022 but in an area thought less likely as shown by the graduated swathe. These are located at Aldham, south of Bramford, south of the AONB and at Great Horksley.



The Great Grid Upgrade

Norwich to Tilbury

Our proposals in Braintree



Our plans in this section

The overhead line would continue south-west into Braintree.

The alignment would pass to the north of Witham and the south of Silver End, before crossing the railway again heading south west into Chelmsford district.

Changes since our 2022 consultation

Changes within the 2022 preferred draft corridor

We are proposing to underground a small section of the route north of Fairstead, with CSE compounds at either end, to cross beneath the existing 400 kV overhead line. The location of this crossing has moved to an area within the 2022 corridor previously considered less likely to be used.

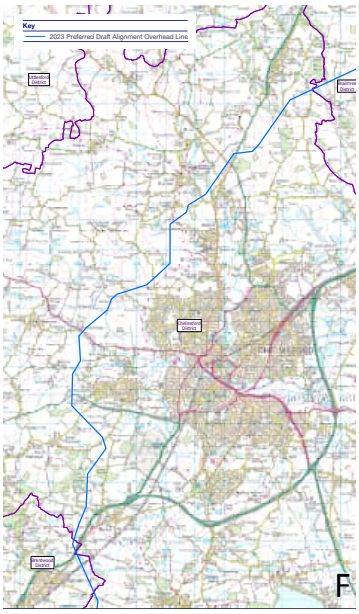
This change is in response to consultation feedback and to reduce effects on residential amenity.



The Great Grid Upgrade

Norwich to Tilbury

Our proposals in Chelmsford



Our plans in this section

The overhead line would enter the district from the north-east and would run to the north of Chelmsford. From there it would head south on the western side of the town, and to the west of Writtle.

The alignment would then continue south, passing to the west of Margaretting, and crossing over the A12 to the north of Ingatestone on the Brentwood border. It briefly re-enters Chelmsford district to the south associated with the change East of Ingatestone described in Section G.

Changes since our 2022 consultation

Changes outside the 2022 preferred draft corridor

West of Writtle

The preferred draft alignment has been straightened slightly west of Writtle and would deviate outside the 2022 preferred draft corridor by up to approximately 110 m for a distance of approximately 400 m.

Changes within the 2022 preferred draft corridor

At Bushy Wood, the alignment would now pass to the east to increase the distance from properties on Woodhall Hill Road. This would be routed within the preferred draft corridor presented in 2022 but in an area thought less likely as shown by the graduated swathe.



The Great Grid Upgrade

Norwich to Tilbury

Our proposals in Basildon and Brentwood

(and Chelmsford east of Ingatestone)



Our plans in this section

Passing to the north and east of Ingatestone, the overhead line alignment would cross the A12 and the railway in the north of the Brentwood district. It would then travel directly south, crossing multiple times between Chelmsford, Basildon and Brentwood.

Passing to the east of Brentwood and the west of Billericay, the alignment would continue south, crossing the A127 and railway on the border of the Thurrock district.

Changes since our 2022 consultation

Changes outside the 2022 preferred draft corridor

Further East of Ingatestone

The overhead line alignment would now pass further east of Ingatestone, diverting from the crossing of the A12 to the east of Stock Lane, continuing south passing to the east of the waste water treatment works, re-joining the preferred corridor north of the crossing of Rayleigh Road.

Changes within the 2022 preferred draft corridor

Between West Horndon and Basildon, the alignment would now run along the eastern edge of the 2022 preferred draft corridor. This would reduce interaction with the Dunton Hills Garden Village proposals.



The Great Grid Upgrade

Norwich to Tilbury

Our proposals in Thurrock



Our plans in this section

The overhead line alignment would continue south, passing Bulphan to the west and Horndon on the Hill to the east. The alignment would then head east, then south, crossing the A13 to the north-east of Southfields, before heading south, to the west of Linford.

From here, the overhead line alignment would transition to underground cables at a CSE compound, proposed to be sited to the north of the Lower Thames Crossing proposals.The underground cable alignment would then run south into Tilbury Substation.

Work would be required at Tilbury Substation to connect the new reinforcement.

Changes since our 2022 consultation

Changes within the 2022 preferred draft corridor

We are not progressing the corridor passing to the east of East Tilbury.

We are proposing to install underground cables from the north of the Lower Thames Crossing proposals into Tilbury Substation within the western corridor indicated in the 2022 consultation.



The Great Grid Upgrade

Norwich to Tilbury

Have your say

We want to hear the views of local people. Knowing what matters to you, matters to us, so please get in touch and provide your feedback.

We will carefully consider all feedback and we will respond to it as part of our application for development consent.

How do I find out more about your proposals?

You can find out more about our plans in a number of ways:

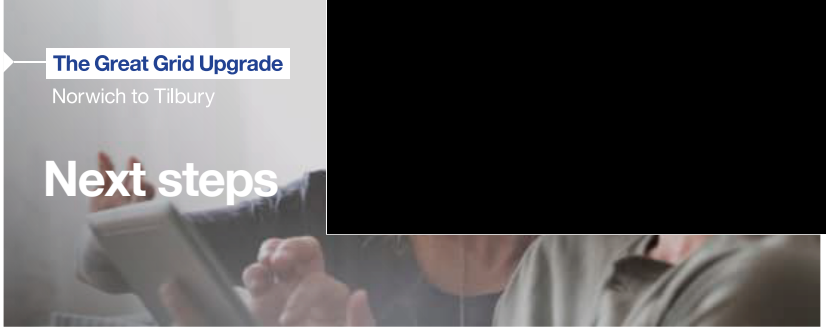
- **Online:** view all information and the interactive map on our project website **nationalgrid.com/norwich-to-tilbury**
- **Events:** please attend one of our public events along the route
- **Webinars:** attend one of our online webinars
- **Visit:** visit an information point to view to collect a feedback form.

How do I respond to the consultation?

Please provide your feedback by **21 August 2023**. You can do this by:

- completing our online feedback form at **nationalgrid.com/norwich-to-tilbury**
- sending a completed paper copy of the feedback form or a letter to **Freepost N to T** (no stamp or further address needed)
- emailing your comments to **contact@n-t.nationalgrid.com**
- calling us on **0800 151 0992.**

nationalgrid.com



The Great Grid Upgrade

Norwich to Tilbury

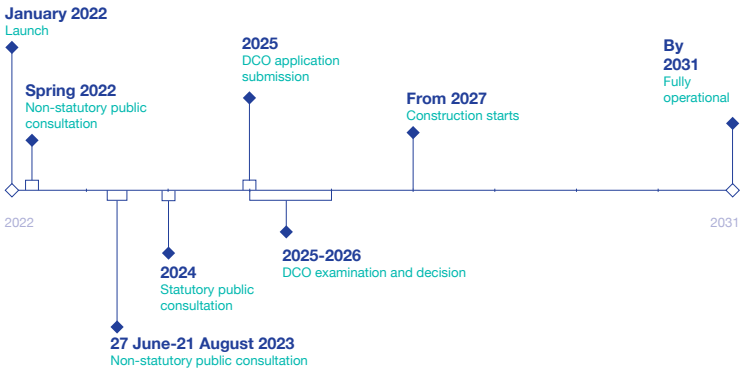
Next steps

Your feedback will help us as we develop our proposals for Norwich to Tilbury. Following this consultation we will review all responses as we continue to develop our plans.

We expect to hold a further consultation in 2024 which will be a 'statutory' consultation.

We expect Norwich to Tilbury will be classified as a Nationally Significant Infrastructure Project (NSIP). Under the Planning Act 2008 we would need to apply for a Development Consent Order (DCO).

Our DCO application will include a Consultation Report to show how we have had regard to your comments. DCO applications are submitted to The Planning Inspectorate (PINS) and examined independently before a recommendation is made to the Secretary of State for Energy Security and Net Zero (DESNZ) who makes the final decision.



Contact us

If you have any questions on Norwich to Tilbury call our Community Helpline:

0800 151 0992 (Lines are open Monday to Friday 9:00am – 5:30pm)

Email us:
contact@n-t.nationalgrid.com

Write to us:
Freepost N to T
(No stamp or further address details are required)

If you feel your land may be affected by these proposals, please contact the Norwich to Tilbury Lands Team at Fisher German by:

Phone: 0808 1753 314

Email: Norwich-Tilbury@fishergerman.co.uk

Post: Norwich to Tilbury Lands Team at - Unit H2 Risby Business Park, Newmarket Road, Risby, Bury St Edmunds, IP28 6RD

nationalgrid.com



The Great Grid Upgrade

Norwich to Tilbury

Grid in the community

Opportunities for young people

Looking for an exciting way into an industry that is secure, innovative, practical and purposeful?

Find out more about careers, apprenticeships and student placements with National Grid:

[redacted]

Grid for Good

Grid for Good is our flagship programme that helps increase access to training and employment opportunities for young people.

We support students with career coaching and masterclasses.

We've reached over 300 students from four schools across Norfolk, Suffolk and Essex already this year, with more activities to come.

Find out more about the Grid for Good scheme:

[redacted]

Events for young people

As part of our 2023 non-statutory consultation, we want to engage with young people to hear your thoughts on our project and provide an opportunity to influence our proposals.

During the consultation period we are holding focused events for young people and students. **Go to our website for details.**

Net Zero Norwich – Our Beryl Bike Partnership

We have partnered with Beryl, the UK's leading micromobility provider, to support the bike, e-bike and e-scooter sharing scheme in Norwich.

The collaboration will help to reduce traffic congestion and carbon emissions, improving mental and physical health and air quality in the city and beyond.



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Appendix I13

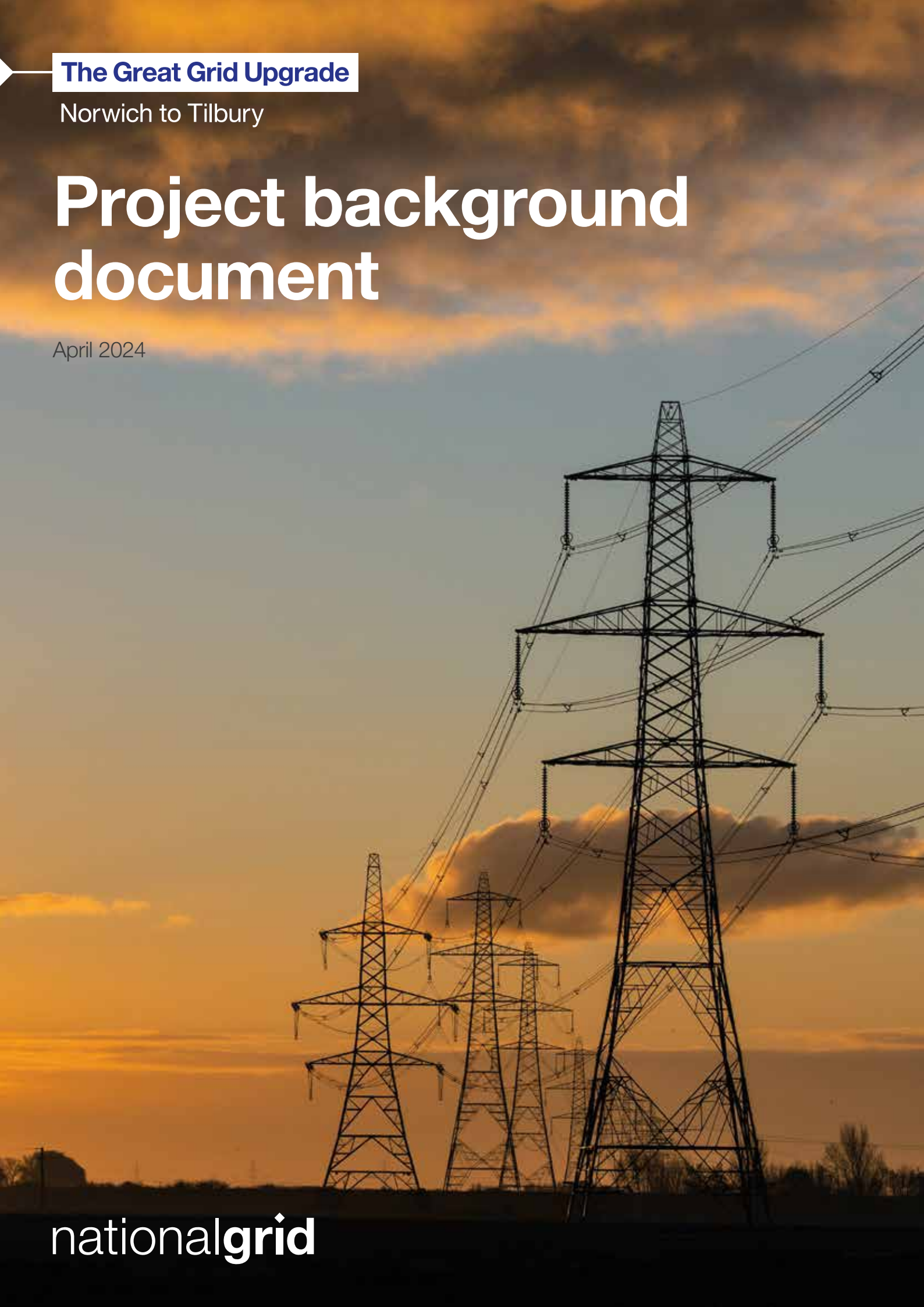
Project Background Document 2024

The Great Grid Upgrade

Norwich to Tilbury

Project background document

April 2024



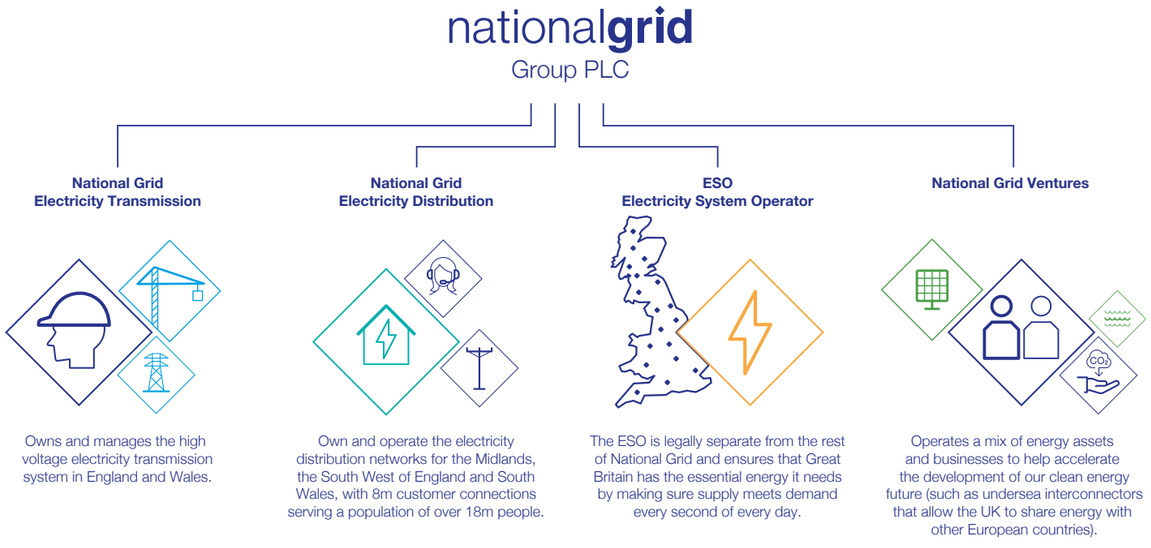
nationalgrid

About National Grid

National Grid delivers electricity safely, reliably and efficiently to the customers and communities we serve – all while working towards building a cleaner, fairer and more affordable energy system for the future.

The parts of National Grid involved in ensuring we all have the essential electricity supplies we need are shown in the diagram below.

Each is a separate legal entity with its own role and responsibilities across England and Wales.



National Grid Electricity Transmission (NGET), referred to in this document as National Grid, sits at the heart of Britain's energy system, connecting millions of people and businesses to the energy they use every day. Every time a phone is plugged in, or a switch is turned on, we have played a part, connecting you to the electricity you need.

National Grid is developing the proposals set out in this document. It must, under the Electricity Act 1989, do so in an efficient, coordinated, and economical way which also considers people, places and the environment.

To find out more about how we develop our proposals, please see our video[1] explaining how we work.

[1] National Grid Electricity Transmission, 'How we work' video players.brightcove.net/867903724001/default_default/index.html?videoId=6329276694112

Foreword

The UK Government has committed to reaching net zero emissions by 2050. This means achieving a balance between the greenhouse gases put into the atmosphere and those taken out. Decarbonising the energy system is vital to achieving net zero.

At National Grid, we are investing around £1.3 billion each year to adapt and develop our network to connect new sources of low carbon energy to homes and businesses.

We are investing for the future, connecting more and more low carbon electricity to our network and playing a crucial role in turning the UK's net zero ambitions into reality.

By the end of the decade, there could be as much as 18 gigawatts (GW) of new, cleaner electricity – enough to power around 18 million homes – connected into the East Anglian network. Ensuring this energy can reach homes and businesses means we need to improve our onshore energy infrastructure, much of which was built to accommodate less demand.

The Norwich to Tilbury proposals would reinforce the electricity transmission network in East Anglia, adding much needed capacity to the network. These proposals are part of The Great Grid Upgrade, the largest overhaul of the grid in generations.

I am pleased to share our latest proposals for Norwich to Tilbury with you. We are now seeking feedback on these proposals in our third consultation, which runs from 10 April to 18 June 2024. I encourage you to share your views on our proposals for where the new infrastructure could be built as well as any comments on preliminary environmental studies.

All documents published as part of this consultation, including this Project Background Document, can be found at **nationalgrid.com/norwich-to-tilbury** and are available on request by contacting the Project team at **contact@n-t.nationalgrid.com** or 0800 915 2497.

I encourage everyone to take time to review our proposals and respond by **18 June 2024**.



Liam Walker
Project Director,
Norwich to Tilbury

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1. The consultation

We are now consulting on our proposals for Norwich to Tilbury, which include a new 400 kilovolt (kV) electricity transmission line, work at existing substations and a new substation that would connect the energy generated by offshore windfarms and interconnectors to the transmission network.

The deadline for providing feedback is 11.59pm on Tuesday 18 June 2024.

This is our third public consultation on proposals for Norwich to Tilbury (The Project). It is called a statutory consultation because it is being carried out in line with the formal requirements of the Planning Act 2008. It follows two previous non-statutory consultations on our draft proposals which were held in 2022 and 2023.

As our current plans propose more than 2 kilometres (km) of overhead line, we expect the Project would be classified as a nationally significant infrastructure project (NSIP) under the Planning Act 2008. This means we need to apply for a type of planning consent called a Development Consent Order (DCO) to build and operate it.

Consultation is an important part of the DCO process as it enables everyone to comment on the proposals, with feedback helping inform their development – along with technical assessments and environmental surveys – before we submit our DCO application to the Planning Inspectorate.

Once the DCO application is submitted, the Planning Inspectorate on behalf of the Secretary of State (SoS), has up to 28 days to decide whether or not the application meets the standards required to be accepted for examination.

If the application is accepted, it will go through a six-month examination period. Careful consideration is given by the Examining Authority, including to all relevant and written representations, and supporting evidence. The Examining Authority is the Inspector or the Panel of Inspectors appointed to conduct the Examination of the application for the DCO.

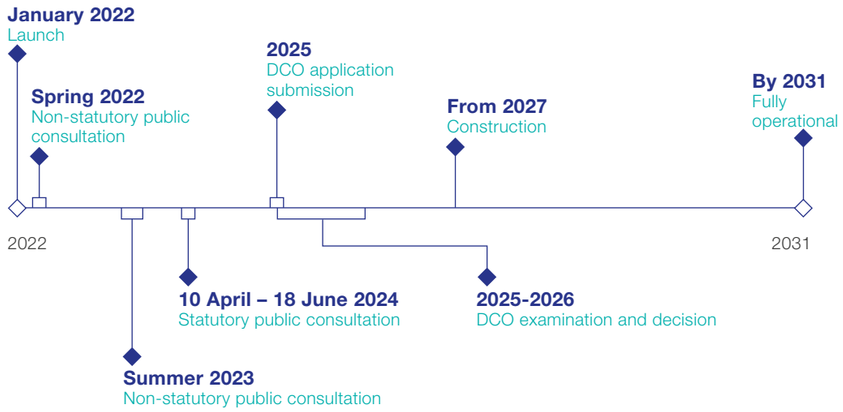
The Examining Authority must prepare a report on the application and submit this to the SoS, including a recommendation, within three months of the close of Examination. The SoS has a further three months to make a decision on whether to grant or refuse development consent. To find out more about the DCO process[2], please see the Planning Inspectorate website.

All feedback we receive as part of this consultation will be carefully considered as we finalise our proposals before submitting our DCO application.

We have published a Statement of Community Consultation (SoCC), which sets out how we are carrying out this consultation. The SoCC was developed in consultation with relevant local authorities and is available on the Project website.

[2] National Infrastructure Planning, The process infrastructure.planninginspectorate.gov.uk/application-process/the-process/

Project timeline



During this consultation we are asking for feedback on our latest proposals for Norwich to Tilbury, which include:

- approximately 159 km of new overhead line supported on approximately 510 steel lattice pylons (typically 50 metres (m) in height) some of which are gantries (typically up to 15 m in height) within proposed CSE compounds, or existing or proposed substations
- approximately 25 km of 400 kV underground cabling some of which is located through the Dedham Vale National Landscape (formerly known as Dedham Vale AONB)
- six new CSE compounds, each with a permanent access, to connect the overhead lines to the underground cables
- a new 400 kV East Anglia Connection Node (EACN) substation, with a new permanent access, on the Tendring Peninsula. This is proposed to be an air insulated switchgear (AIS) substation
- substation extension works at the existing Norwich Main and Bramford substations, and works within the existing Tilbury Substation to connect and support operation of the new transmission connection; and
- temporary works associated with construction of the Project.

An alternative design at the Waveney Valley (referred to as the Waveney Valley Alternative) is also being considered and is the subject of consultation and ongoing assessment. This design alternative, if taken forward, would result in changes to those elements of the proposed Project listed to the left. This would instead comprise of the:

- installation of approximately 157 km of new 400 kV overhead line
- installation of approximately 27 km of 400 kV underground cabling, some of which is located through the Dedham Vale National Landscape
- eight new CSE compounds (each with a permanent access) to connect the overhead lines to the underground cables.

If the Waveney Valley Alternative is taken forward there would be approximately 2 km less of new 400 kV overhead line, approximately 2 km more 400 kV underground cabling and two additional new CSE compounds. Each CSE compound would require permanent access, to connect the overhead lines to the underground cables.

All other works listed in the earlier bullet points would remain consistent within the Waveney Valley Alternative.

In addition, third party utilities diversions and / or modifications would be required for construction. There would also be land required for mitigation, compensation and enhancement of the environment including for biodiversity net gain (BNG).

Additional land would also be required temporarily for construction activities including, for example, working areas for construction equipment and machinery, site offices, welfare, storage, and temporary construction access.

We are also consulting on the preliminary findings from our environmental studies and assessments as well as proposed mitigation.

Our current proposals are outlined in this **Project Background Document**, along with information about where to find out more and get involved in the consultation. As part of this consultation, we have also published:

Preliminary Environmental Information Report (PEIR): setting out the preliminary findings from the environmental studies and assessments we are carrying out to develop our proposals.

Non-Technical Summary (NTS) of the PEIR: a summary of the PEIR in non-technical language.

Design Development Report 2024: detailing the design work we have undertaken to date, including since the 2023 consultation.

Community Newsletter: summarising details of the Project and public consultation. This has been mailed to over 77,000 addresses in the areas around the preferred draft alignment.

2023 Non-Statutory Consultation Feedback Report: summarising the feedback we received during the 2023 consultation and how it has been considered.

Strategic Options Backcheck and Review 2024: an overview of the appraisal approach we have used to date to consider strategic options. These are reviewed and backchecked as part of the ongoing strategic options assessment and decision-making process.

Maps of our proposals 2024: showing the updated preferred draft alignment.

Feedback questionnaire: to gather consultation comments and feedback.

Statement of Community Consultation (SoCC): setting out how we are carrying out this consultation. The SoCC was developed in consultation with relevant local authorities.

All of these documents are available to download from our Project website **nationalgrid.com/norwich-to-tilbury**. Printed copies of consultation documents are available on request. Technical documents and large plans may be subject to a reasonable charge to cover printing and postage fees.

Printed copies of consultation documents will also be available to view at our public information events (see page 9 for details) and at inspection location (see pages 10-12 for details).

Documents are available on request by contacting the Project team by email at **contact@n-t.nationalgrid.com** or by calling 0800 915 2497.

Environmental Impact Assessment

Norwich to Tilbury is classed as development requiring assessment of likely significant effects on the environment under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

We are carrying out an Environmental Impact Assessment (EIA) and will submit a full Environmental Statement (ES) and Non-Technical Summary (NTS) as part of our application for development consent.

This consultation includes the preliminary environmental information that has been collected and assessed to date, along with the measures that may need to be put in place to avoid, prevent, reduce and mitigate any residual environmental effects. Please see the PEIR and NTS of the PEIR for more information.

How to find out more

This consultation will run for ten weeks from 12.00 noon on Wednesday 10 April to 11.59pm on Tuesday 18 June 2024, and is open to anyone with an interest in our proposals.

All consultation information is available on our website **nationalgrid.com/norwich-to-tilbury**. Printed copies of consultation documents are available to view at public information events and inspection points.

During the consultation we are holding a series of public information events (see Table one). These events will include information about our proposals, with copies of maps and technical documents available to view. Members of the Project team will be available to answer questions about our proposals.

We are holding six online webinar sessions, two of which will cover a general overview of our proposals. The other four will be section specific. You can attend the webinar most relevant to you. A recording of the general overview webinar will be available to view on our website once available.

Details on how to sign up for a webinar are available on our website, by contacting us on 0800 915 2497 or by email at **contact@n-t.nationalgrid.com**.

We recognise that some people require documents in alternative formats, need supported access to information or may not have access to the internet. If you or anyone you know has difficulty accessing information or providing feedback, please contact us. We are aiming to make our consultation as inclusive as possible and our community relations team will be pleased to help.

Table one: Public information events

We have selected event venues that are close to the proposed route. Larger event venues are highlighted with an '*' where there will be more space to view displays and digital materials.

Date and time	Venue
Wednesday 24 April 2024 12-5pm	Towngate Theatre, St Martin's Square, Basildon, Essex SS14 1DL
Thursday 25 April 2024 2-7pm	The Brentwood Centre, Doddinghurst Road, Pilgrims Hatch, Brentwood CM15 9NN *
Saturday 27 April 2024 11am-4pm	Chelmsford City Racecourse, Chelmsford CM3 1QP *
Tuesday 30 April 2024 12-5pm	Gislingham Village Hall, Mill Street, Gislingham IP23 8JT
Wednesday 1 May 2024 11am-4pm	Copdock Village Hall, Old London Road, Copdock IP8 3JN
Friday 3 May 2024 1-6pm	Needham Market Community Centre, School St, Needham Market, Ipswich IP6 8BB
Saturday 4 May 2024 11am-4pm	Lawford Venture Centre 2000, Bromley Road, Lawford, Manningtree CO11 2JE
Wednesday 8 May 2-7pm	The Civic Hall, Blackshots Lane, Grays RM16 2JU *
Thursday 9 May 2024 1-6pm	Thorpe Hall, Ashwell Thorpe and Fundenhall Community Centre, Muskett Road, Ashwellthorpe NR16 1FD
Friday 10 May 2024 1-6pm	Tibenham Community Hall, Pristow Green Lane, Tibenham, Norwich NR16 1PX
Tuesday 14 May 2024 11am-4pm	Witham Public Hall, Collingwood Road, Witham CM8 2DY
Wednesday 15 May 2024 1-6pm	Diss Town Football Club, Diss IP22 4QP
Thursday 16 May 2024 2-7pm	Langham Community Centre, School Road, Langham, Colchester CO4 5PA
Friday 17 May 2024 1-6pm	Great Bromley Village Hall, Parsons Hill, Great Bromley, Colchester CO7 7JA

Table two: Webinars

Date and time	Topic
Wednesday 17 April 6-7pm	Project Overview One †
Wednesday 29 May 6-7pm	Section A and B – South Norfolk and Mid Suffolk
Thursday 30 May 6-7pm	Section C and D – Babergh, Tendring and Colchester
Wednesday 5 June 6-7pm	Section E and F – Braintree and Chelmsford
Thursday 6 June 6-7pm	Section G and H – Basildon, Brentwood and Thurrock
Wednesday 12 June 6-7pm	Project Overview Two

† A British Sign Language interpreter will be available

You can register for a webinar by signing up on our Project website
nationalgrid.com/norwich-to-tilbury

Table three: Inspection points:

Information about Norwich to Tilbury is available to view and collect from the following locations from **Wednesday 10 April 2024**.

Location	Address	Opening hours	
Long Stratton Library	The Street, Long Stratton NR15 2XJ	Monday Tuesday Wednesday Thursday Friday Saturday Sunday	11am-7pm 1pm-7pm 8am-7pm (unstaffed) 1pm-7pm 8am-7pm (unstaffed) 11am-4pm 10am-4pm (unstaffed)
Norwich Library	Unit 3, The Forum, Millenium Plain, Norwich NR2 1AW	Monday - Friday Saturday	10am-7pm 9am-5pm
Tuckswood Library	Robin Hood Road, Eaton NR4 6BX	Monday Tuesday Wednesday Thursday Friday Saturday Sunday	8am-7pm (unstaffed) 11am-7pm 8am-7pm (unstaffed) 8am-7pm (unstaffed) 11am-7pm 10am-4pm 10am-4pm (unstaffed)
Diss Library	Church Street, Diss IP22 4DD	Monday Tuesday Wednesday Thursday Friday Saturday Sunday	10am-7pm 8am-7pm 10am-7pm 10am-7pm 10am-7pm 10am-7pm 10am-4pm

Location	Address	Opening hours	
Stowmarket Library	Milton Road, Stowmarket IP14 1EX	Monday Tuesday Wednesday Thursday Friday Saturday Sunday	Closed 8:30am-6:45pm 8:30am-5:45pm 8:30am-5:45pm 8:30am-6:30pm 8:30am-4pm 10am-4pm
Capel St Mary Library	Village Hall, The Street, Capel St Mary IP9 2EF	Monday Tuesday Wednesday and Thursday Friday Saturday Sunday	Closed 9am-12:30pm, 2-5:30pm 9am-12:30pm 2-5:30pm 9am-3pm 10am-3pm
Coggeshall Library	The Friends Meeting House, Stoneham Street, Coggeshall CO6 1UH	Monday Tuesday Wednesday Thursday Friday Saturday Sunday	Closed 2-5:30pm Closed 9am-5:30pm Closed 9am-5pm Closed
Chelmsford Library	Market Road, Chelmsford CM1 1QH	Monday Tuesday Wednesday Thursday Friday Saturday Sunday	9am-5:30pm 9am-5:30pm 9am-5:30pm 9am-7pm 9am-5.30pm 9am-5pm 10:30am-1:30pm
Colchester Library	Trinity Square, Colchester CO1 1JB	Monday Tuesday Wednesday Thursday Friday Saturday Sunday	9am-5:30pm 9am-5:30pm 9am-7pm 9am-5:30pm 9am-5:30pm 9am-5pm 1-4pm
Tilbury Library	Civic Square, Tilbury RM18 8AD	Monday Tuesday Wednesday Thursday - Sunday	10am-1pm and 2-5pm Closed 10am-1pm and 2-5pm Closed
Greenstead Library	Hawthorn Avenue, Colchester CO4 3QE	Monday Tuesday Wednesday Thursday Friday Saturday Sunday	9am-5:30pm 9am-5:30pm Closed 9am-5:30pm Closed 9am-5pm Closed

Location	Address	Opening hours	
Stanway Library	10 Villa Road, Stanway CO3 0RH	Monday Tuesday Wednesday Thursday Friday Saturday Sunday	Closed 2-7pm Closed 9am-1pm Closed 9am-1pm Closed
Prettygate Library	Prettygate Road, Colchester CO3 4EQ	Monday Tuesday Wednesday Thursday Friday Saturday Sunday	Closed 9am-7pm 9am-5:30pm Closed 9am-5:30pm 9am-5pm Closed
Wivenhoe Library	104/6 High Street, Wivenhoe CO7 9AB	Monday Tuesday Wednesday Thursday Friday Saturday Sunday	Closed 2-7pm Closed 9am-5:30pm Closed 9am-5pm Closed

Inspection point opening hours can be subject to change. Please check with the relevant venue for the most up to date opening hours. Unstaffed hours require a library card for entry.

To learn more about our proposals:

- Read this Project Background Document
- Visit an inspection point (see Table three)
- Visit our website at: nationalgrid.com/norwich-to-tilbury
- Sign up to receive project update emails (visit our website)
- Come to a public information event (see Table one)
- Call our freephone 0800 915 2497 between 9am and 5:30pm
- Join an online webinar session (see Table two)
- Email us: contact@n-t.nationalgrid.com

To respond to the Norwich to Tilbury consultation:

- Complete the feedback questionnaire on our website nationalgrid.com/norwich-to-tilbury
- Post your written responses (no stamp required) to: FREEPOST N TO T
- Email your comments to: contact@n-t.nationalgrid.com
- Complete a printed feedback questionnaire and return it using the freepost address

Your comments must be received by 11:59 pm on 18 June 2024.

2. The need

The UK has set a world-leading target for tackling climate change: to achieve net zero carbon emissions by 2050. This means that we will remove the same amount of greenhouse gases from the atmosphere as we produce. The Great Grid Upgrade will connect clean energy that's produced right here in the UK, increasing the self-sufficiency of our energy supplies.

Great Britain already has 8.5 gigawatts (GW) of offshore wind energy in operation, and another 1.9 GW under construction. The Government's Energy White Paper[3] (December 2020) outlines a plan to increase energy from offshore wind to 40 GW by 2030 (this Government target was increased in April 2022 to 50 GW).

Recent years have been record-breaking for renewables on our electricity transmission network. Summer 2020 saw the longest run without burning coal since the industrial revolution, stretching almost 68 days. Solar power has set new records too, with 10.1 GW being produced in April 2023. Finally, the first three months of 2023 saw wind power rank as the biggest single source of electricity in the UK for the first time ever.

While the way electricity is generated is changing, demand is also set to significantly increase as the way we power our homes, businesses, industry and transport changes. As the nation moves towards net zero, the fossil fuels that once powered our economy will continue to be replaced with sources of low-carbon electricity.

Meeting government targets will be a major step towards decarbonising our economy and, providing customers with clean, secure, and affordable energy.

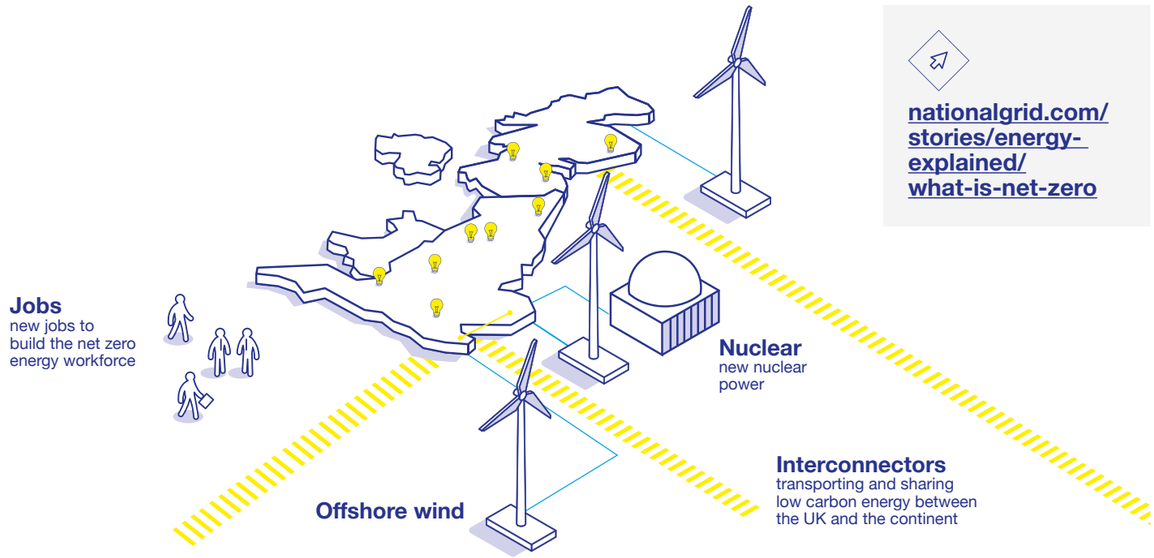
To deliver more clean power to homes and businesses and increase our energy security, we must also upgrade the transmission system – 'the grid' – at an unprecedented scale and pace (see the Government's 'Powering up Britain'[4] report).

Delivering the infrastructure needed to achieve this ambition will boost local economies, provide jobs and opportunities to learn new skills and bring vital investment to towns right across the country.

Norwich to Tilbury is a vital part of the transition to net zero. By the end of the decade, there could be as much as 18 GW of new, cleaner electricity – enough to power around 18 million homes – connected into the East Anglian network. Ensuring this energy can reach homes and businesses means we need to significantly improve our onshore electricity infrastructure, much of which was built to accommodate less demand.

[3] Energy white paper: Powering our Net Zero future, 18 December 2020
www.gov.uk/government/publications/energy-white-paper-powering-our-net-zero-future/energy-white-paper-powering-our-net-zero-future-accessible-html-version

[4] Powering up Britain, Department for Energy Security and Net Zero, March 2023
assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1147340/powering-up-britain-joint-overview.pdf



nationalgrid.com/stories/energy-explained/what-is-net-zero

Why here?

Like much of the high voltage electricity transmission network across the country, the network in East Anglia was largely developed in the 1960s. It was built to supply regional demand, centred around Norwich and Ipswich, and fed from our Bramford Substation.

A large loop runs from Walpole in the north of the region to Pelham and Rayleigh/Tilbury in the south via Norwich and Bramford. Two 400 kilovolt (kV) overhead lines connect Sizewell B.

Growth in offshore wind generation and interconnectors to Europe has seen a significant number of connections planned in the East Anglian and south-east coastal areas of England.

The existing transmission network infrastructure in the East Anglian and south-east areas was not originally designed to accommodate such large volumes of generation capacity.

As such the network will require significant reinforcements both in the form of new substations and transmission circuits to provide connections for these new customers and to ensure that power can be transferred securely to the onshore demand centres to meet the needs of electricity consumers in Britain.

Norwich to Tilbury, along with other projects, is a priority because the Midlands, South and East of England – which cover areas spanning from the Humber in the North to East Anglia and the Thames Estuary in the south – have been identified as needing network reinforcement to enable the connection of more offshore wind on the east coast.

National Grid Electricity System Operator (ESO) is responsible for considering how much energy needs to be carried on the network in the future and where network capability needs to be improved to accommodate supply. More information on the way it reviews how the network needs to adapt is available at **nationalgrideso.com/future-energy**.

Current generation and demand in East Anglia

To understand current and future demands on the electricity network, the concept of network boundaries is used.

A boundary splits the system into sections and shows where there are high power flows between parts of the network. When flows across a network boundary are forecast to be above the capability of the network, there are two options to manage this:

1. Pay electricity generators on one side of the boundary to reduce the energy they produce (and in turn pay generators on the other side of the boundary to compensate for the shortfall). This then reduces the flows of electricity across the boundary.

   When National Grid ESO pays generators to do this, these are called ‘constraint payments’.

2. Increase the capability of the network to allow more electricity to flow.

Management of constraint costs in the short term may be in the interests of consumers, but ultimately the Security and Quality of Supply Standard (SQSS) requires the capability of boundaries to be reinforced to accommodate power flows and prevent constraint costs being incurred on a long-term basis. Details of generation connected in the region are available in the 2024 Strategic Options Backcheck and Review.

The Security and Quality of Supply Standard (SQSS)

The network is planned and operated under a set of standards designed to ensure there are no widespread electricity supply interruptions, even if two circuits are out of service.

Each line of pylons on the network carries two electrical circuits.

For example, if one circuit is switched out for planned maintenance and another is impacted by a fault at the same time, the SQSS is designed to ensure that:

- the electricity system frequency is maintained within statutory limits
- no part of the network is overloaded beyond its capability
- voltage performance stays within acceptable statutory limits
- the system remains electrically stable.

National Grid ESO oversees the standards and they are approved by Ofgem.

The relevant boundaries in East Anglia and the South East are illustrated in the network diagram below. This includes the proposed Bramford to Twinstead project, for which National Grid submitted an application for development consent in April 2023.



East Anglia and South East region transmission system and system boundaries (figure from 2024 Strategic Options Backcheck and Review).

Future generation and demand

Although the network in East Anglia can accommodate the level of generation and demand that there is today, this situation will change over the next decade.

New connections for new offshore wind and nuclear power generation projects, and for interconnectors, are expected into East Anglia by 2030. These are being constructed or are expected to connect into substations at Necton, Norwich Main, Bramford, Friston and Sizewell.

Additionally, agreements are in place with Tarchon Energy for a 1400 megawatt (MW) interconnector between the UK and Germany, along with the North Falls and Five Estuaries offshore wind farms for connection into the new East Anglia Connection Node (EACN) Substation.

National Grid ESO assessments have concluded that the existing high voltage electricity network in East Anglia requires reinforcement to ensure the network continues to meet the SQSS.

Increasing the capability of the existing network

Before we consider building new parts of the network, we first must consider whether we can achieve more capability by upgrading and strengthening the existing network.

This can involve changing the conductors/wires on some of our existing overhead lines and adding smart power control devices to control the flow of electricity on parts of the network to transport it to where it is needed.

In East Anglia we are:

- installing power control devices at main substations in the region – at Pelham, Rye House and Waltham-Cross, to make more use of an existing route to the west of the region
- increasing the voltage of a section of line from Waltham-Cross south into London to 400 kV to increase the capability of that part of the network into the capital
- rewiring existing overhead lines with conductors that can carry more power – for example, on the existing overhead lines from Bramford to Braintree, Rayleigh to Tilbury, Twinstead and Pelham, and between Norwich and Bramford.

In addition to Norwich to Tilbury, we are developing two new reinforcements in East Anglia:

- Bramford to Twinstead Reinforcement – a new 400 kV double circuit overhead line between Bramford in Suffolk and Twinstead Tee in Essex
- Sea Link – a new offshore high voltage direct current (DC) link between Suffolk and Kent

Making these improvements will increase the capability of the existing network, but it is still insufficient to deliver the capability required under SQSS and as advised by National Grid ESO.

A number of studies continue to consider the drivers for network reinforcements in East Anglia, alongside the specific considerations that need to be taken into account for Norwich to Tilbury.

Since our last consultation in 2023, there have been updates from an independent report commissioned by local authorities (Hiorns Smart Energy Networks Report) as well as the Government's Offshore Coordination Support Scheme (OCSS) and a study undertaken by ESO.

We welcome all feedback on our Norwich to Tilbury proposals. At each key stage of the development process, we undertake checks – described as backchecks – to ensure our proposals take account of factors that may arise, as appropriate.

East Anglia Transmission Network Reinforcement Report by Hiorns Smart Energy Networks

An independent review of the strategic options appraisal by National Grid for the Project was carried out by Hiorns Smart Energy Networks.

The report was commissioned by Essex County Council, Norfolk County Council and Suffolk County Council, and reviewed the need and timing for additional electricity transmission capacity out of the East Anglia region by 2030.

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

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

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

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

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

Offshore Coordination Support Scheme (OCSS)

On 5 December 2023, the Department for Energy Security & Net Zero (DESNZ) announced funding to a consortium formed of National Grid's Sea Link project and both the North Falls and Five Estuaries offshore windfarm projects.

The funding is to investigate a coordinated design for offshore energy transmission and to learn lessons to inform future projects.

The consortium will now undertake a series of studies and assessments to determine the feasibility, challenges and solutions of a coordinated offshore connection.

This work will consider the economics, engineering and regulatory challenges as well as the logistics and programme delivery aspects.

The consortium members are continuing to develop each of their onshore DCO proposals in parallel with the coordination studies. Until we know the outcome of those studies, it is important that we continue to develop our proposals for Norwich to Tilbury to meet our statutory duties and responsibilities to deliver the new renewable sources of energy to homes and business across the UK.

ESO East Anglia Network Study (March 2024)

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

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

We remain committed to carefully considering the findings from the ESO Study and we await the Government's decision on the outcome of the OCSS. We will backcheck and review our proposals for Norwich to Tilbury to reflect these within the ongoing development of our East Anglian projects.

In the meantime, to ensure we remain compliant with our legal obligations to connect customers and aligned with the OCSS guidance, we are continuing to progress the development of the existing East Anglian network projects, including Norwich to Tilbury.

3. Our proposals

This section describes our proposals which include a new 400 kilovolt (kV) electricity transmission line, work at existing substations and a new substation that would connect the energy generated by offshore windfarms and interconnectors to the transmission network.

We have held two non-statutory consultations, the first in 2022, followed by another in summer 2023.

Following each consultation we have carefully considered all the feedback we have received and have used it to help us develop and make changes to our proposals.

The main changes we have made to the preferred draft alignment are summarised in this section. We are also proposing smaller adjustments to the proposed locations of pylons, overhead line and underground cabling across the route which can be found in the Design Development Report 2024, and consultation plans are available on our project website **nationalgrid.com/norwich-to-tilbury**.

Overhead lines

We are proposing a new 400 kV electricity transmission connection of approximately 184 km running from Norwich Main Substation to Tilbury Substation via Bramford Substation.

Approximately 159 km of this would be new overhead line supported by approximately 510 steel lattice pylons, some of which would be gantries.

Standard steel lattice pylons are being considered for the Project. This pylon design is common across the electricity system in the UK.

These would typically be around 50 m high with three sets of cross arms, and each pylon would be designed for its location.

The suitability of other pylon designs, including T-pylons, is being reviewed and considered, with an initial assessment indicating that T-pylons would not be suitable. You can read more about this in the **2024 Design Development Report**.



Underground cables

We are proposing approximately 25 km of new 400 kV underground cabling in four sections of the route including around 20 km through and in the vicinity of the Dedham Vale National Landscape.

An alternative design at the Waveney Valley (referred to as the Waveney Valley Alternative) is also being considered and is the subject of consultation and ongoing assessment. See page 27 for more information.

We are also proposing a section of underground cable near Fairstead when crossing the existing 400 kV overhead line.





Proposed underground cable sections of the route.



Cable Sealing End (CSE) compounds

New CSE compounds would be needed to connect the overhead lines to the underground cables.

We are proposing a total of six CSE compounds with associated permanent access at the following locations:

- one north of the Dedham Vale National Landscape
- two near Great Horkesley
- two near Fairstead
- one near Tilbury.

The potential alternative at Waveney Valley (see page 27) would introduce a further section of underground cabling and two additional CSE compounds.

East Anglia Connection Node (EACN) substation

We are proposing a new 400 kV EACN substation on the Tendring Peninsula at a site close to the existing Lawford Substation, owned and operated by UKPN, to connect clean energy from offshore wind generation and a proposed interconnector with Germany to be transported to homes and businesses.

The EACN substation would contain high-voltage electrical equipment such as transformers, circuit breakers and shunt reactors, support structures and control buildings. It would be fenced and include a permanent access road and parking areas.

At this stage, we are proposing that the EACN substation would use air – rather than gas – insulation technology. Air-insulated switchgear (AIS) substations are the most common type, accounting for more than 70 per cent of substations all over the world.



Permanent access roads

Permanent access roads are required at CSEs and substations for operational and maintenance requirements.

More information on access roads can be found in the **construction section**.

Why not build an offshore connection?

Feedback from both the 2022 and 2023 consultations suggested we should consider an offshore connection.

There is no fully offshore solution to connect offshore wind to the grid and we have to bring the power onshore somewhere. Our job is to carefully consider the most feasible options and present proposals for public consultation.

In doing this, we must consider impacts on local communities and the environment and deliver value for electricity consumers.

We have assessed an equivalent offshore option and to deliver the same capacity as the overhead line, we would need to build three subsea cables and associated onshore infrastructure. This would mean significant extra cost to consumers, which would not meet the requirements placed on us.

In addition to cost, there are a range of environmental considerations and other onshore and offshore impacts which would need to be taken into account when assessing this option. Taking all these considerations into account we have concluded that an onshore connection is the most appropriate solution.

Proposals by location

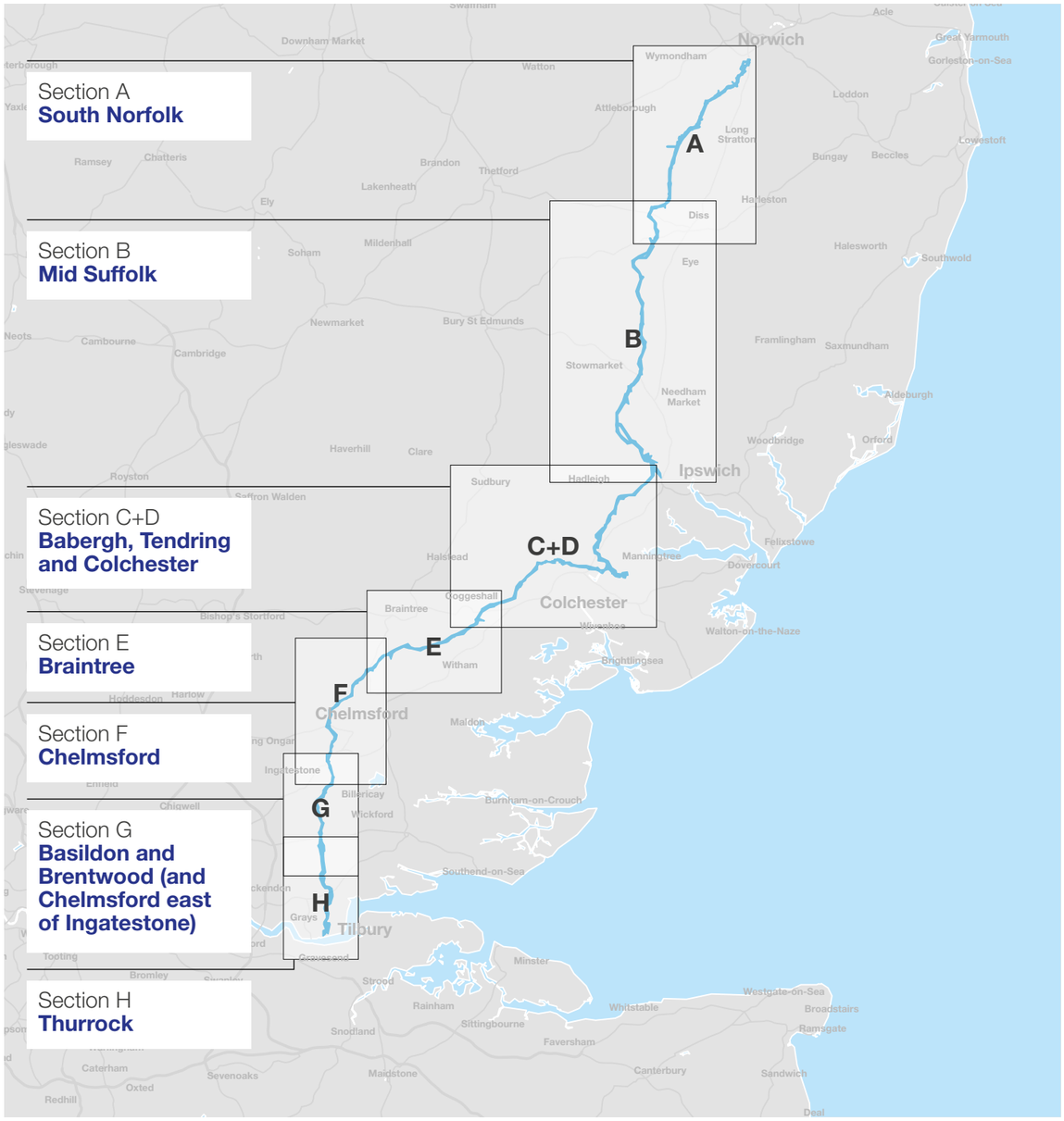
Summaries of the proposals for Sections A to H, including maps, key issues and constraints, are included on the following pages.

These sections also outline changes to the indicative locations of some proposed pylons.

Each pylon proposed for Norwich to Tilbury has been given a unique reference number in the format RG000/ JC000 (pylons in the northern route section) or TB000 (pylons in the southern route section).

The first pylon on the route at Norwich Main Substation is RG001 and the final pylon at Tilbury is TB263.

To view all indicative pylon locations, you can use our interactive map available on the Project website – **nationalgrid.com/norwich-to-tilbury**, the 2024 Design Development Report, and our Project maps / Project area maps.



Map showing sections A-H of Norwich to Tilbury.

Section A
South Norfolk

Section A 2024 preferred draft alignment

We are proposing to build an overhead line heading south out of Norwich Main Substation (the start point of Norwich to Tilbury), and running to the east of Mulbarton, Tacolneston and Shelfanger and then to the west of Roydon on the Mid Suffolk border.

Norwich Main Substation

National Grid is currently developing proposals for extensions to the existing substation at Norwich Main, which is located approximately 5 km south of Norwich. The planned extensions are to enable new sources of electricity – including the Hornsea 3 offshore wind farm and Sheringham Shoal and Dudgeon wind farm extensions – to connect into the grid. With Norwich to Tilbury, that energy could then be transported to homes and businesses.

The western extension would include extending the site by around five hectares and building new equipment (similar to the existing substation), which would make space for Norwich to Tilbury connection as well as other future connections.

We are applying to South Norfolk Council for planning permission for the western extension and will also include this within Norwich to Tilbury's application for a Development Consent Order.

Main changes in section A since the last consultation

South of Norwich Main Substation

A separate developer is proposing battery storage immediately south of Norwich Main Substation. In response to this we have adjusted the preferred draft alignment so pylons RG001 to RG007 (RG1 to RG6 in the 2023 preferred draft alignment) are now positioned to the west of Sprow's Pits Woodland.

Our proposals avoid positioning pylons in the development area for Bloy's Grove Solar Farm which is located between Swainsthorpe and Mulbarton. We have also moved the position of RG12 (now RG13) slightly north to avoid an archaeological site.

We are proposing a minor realignment of overhead line near South Norfolk Model Flying Club to move some pylons in line with landowner requests and to increase separation from the flying club to over 200 m.

We have moved pylon RG44 away from the centre of an open view to the north-west and are proposing to reposition RG43 to facilitate this. The new locations of both pylons benefit from additional screening from existing woodland.

We are also proposing a change between pylons RG046 and RG050. This moves the 2023 preferred draft alignment further east to reduce effects on woodland. Another change in Section A is an adjustment between RG070 and RG073 which removes the single angle pylon at RG72, replacing it with two angle pylons each with smaller direction changes to increase separation from residential properties.



In the Waveney Valley

In response to feedback from the 2023 consultation, we are also considering proposals for a section of underground cables, known as the Waveney Valley Alternative.

The Waveney Valley Alternative proposals would would include the:

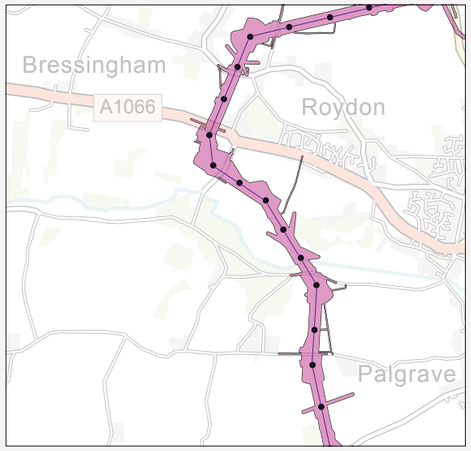
- installation of approximately 2 km of underground cabling (with 2 km of overhead line being removed from our proposals); and
- two CSE compounds (to join the high-voltage underground cables to the overhead line) with associated access roads. This would increase the number of CSE compounds from six to eight.

All other works not listed above would be the same for both the overhead line or underground cable designs in this area.

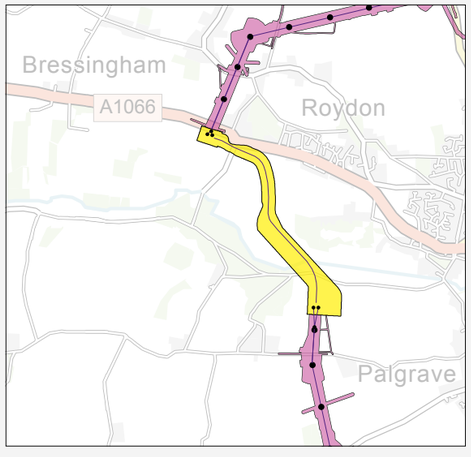
While underground cabling would reduce landscape, recreational amenity and heritage effects in the area, it would have an impact on ecology, archaeology and peat soils, and come at an additional cost.

We are asking for feedback on both alternatives (overhead lines and underground cables) at this consultation.

Please refer to the Design Development Report 2024 for more information on our proposals in this section.

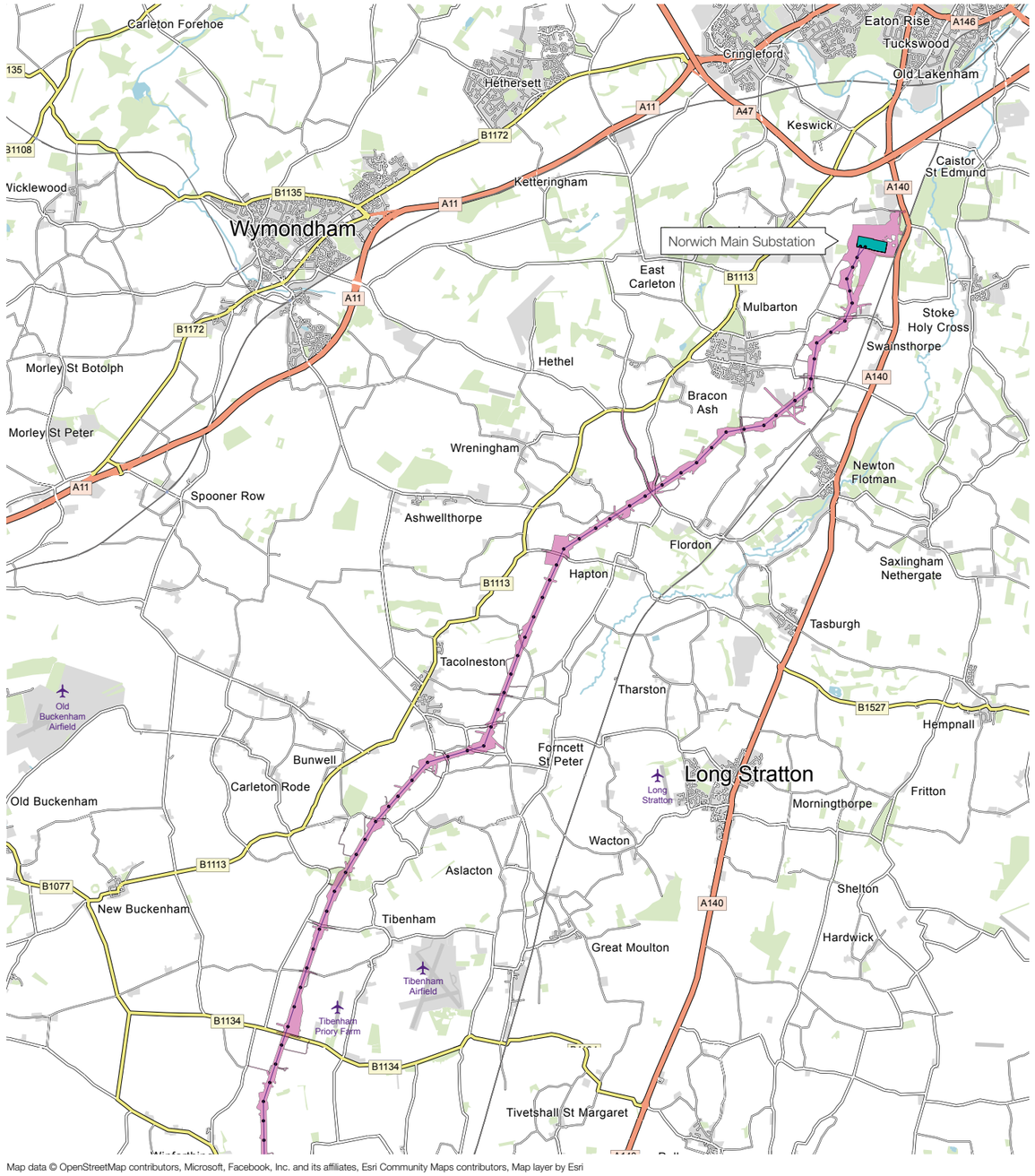


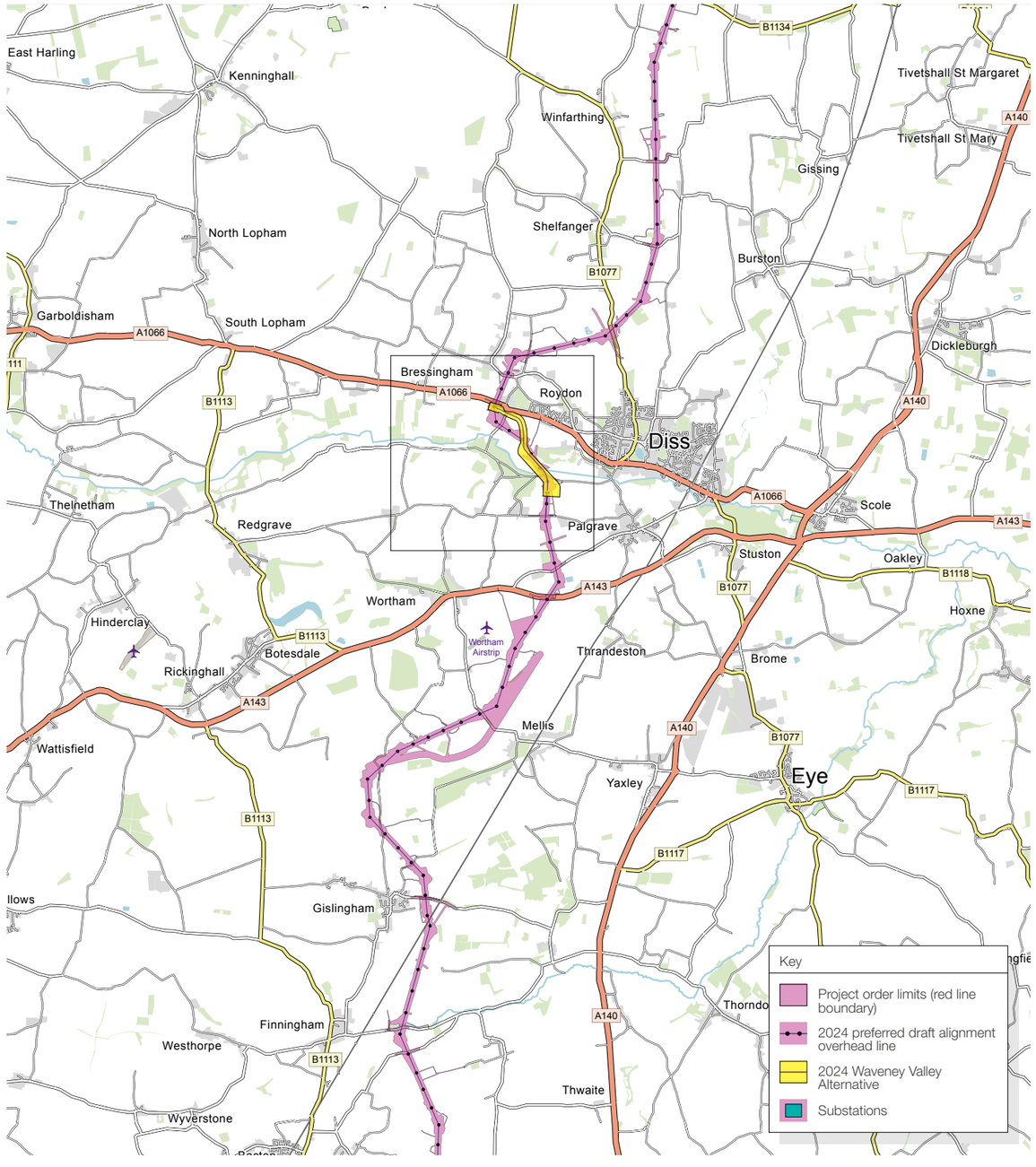
Overhead line proposal



Waveney Valley Alternative

Section A
South Norfolk





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Section B
Mid Suffolk

Section B 2024 preferred draft alignment

From the county boundary between South Norfolk and Mid Suffolk, we are proposing that the preferred draft alignment would run south, passing to the west of Mellis and to the east of Gislingham before crossing the railway.

It would then continue south past Stowupland and Needham Market, before crossing back over the railway and turning eastwards at Offton, running north of Flowton and connecting into Bramford Substation.

From here, the overhead line would run south-east for a short distance to the border with Babergh district.

We are proposing works at the Bramford Substation to allow the new overhead line to connect into it. This includes extension work and the replacement of sections of existing 132 kV overhead lines north of south of the substation with underground cable.

Main changes in section B since our last consultation

In the Waveney Valley

A section of the Waveney Valley Alternative is also routed through section B. See section A for more details.

East of Wortham near Brook Farm Airstrip

We are proposing to move the preferred draft alignment further east at pylons RG90 and RG100 (now RG99) to move further from Brook airstrip and reduce interaction with solar farm developments.

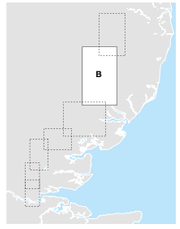
The proposed change also moves pylons RG91, RG92, RG93 and RG94 further east and further away from properties.

This would reduce the effects on views to the north for some of these residential properties.

North and west of Mellis Common

We are proposing to follow the alignment of the existing 132 kV lattice pylon line to the north of Mellis before passing further west of Mellis. The proposed change reduces effects on the conservation area and places the preferred draft alignment further from heritage assets.

This change would move the draft alignment further away from Mellis Common to the north of Great Wood.



Gislingham to Offton

We are proposing a change between RG118 and RG123 (now RG119 and RG124) moving the 2023 preferred draft alignment to the west to position pylons closer to field boundaries.

Another change between RG123 and RG130 would move the preferred draft alignment to the east and further away from the Grade II listed Hempnalls Hall and nearby residential properties.

We are proposing a series of changes between RG145 and RG161 to respond, where practicable, to landowner feedback on siting preferences which also reduce effects on heritage assets near to Badley Hill.

We are proposing to move RG161 (now RG162) to the south-west by approximately 50 m, positioning the pylon closer to the corner of a field.

Offton to Bramford

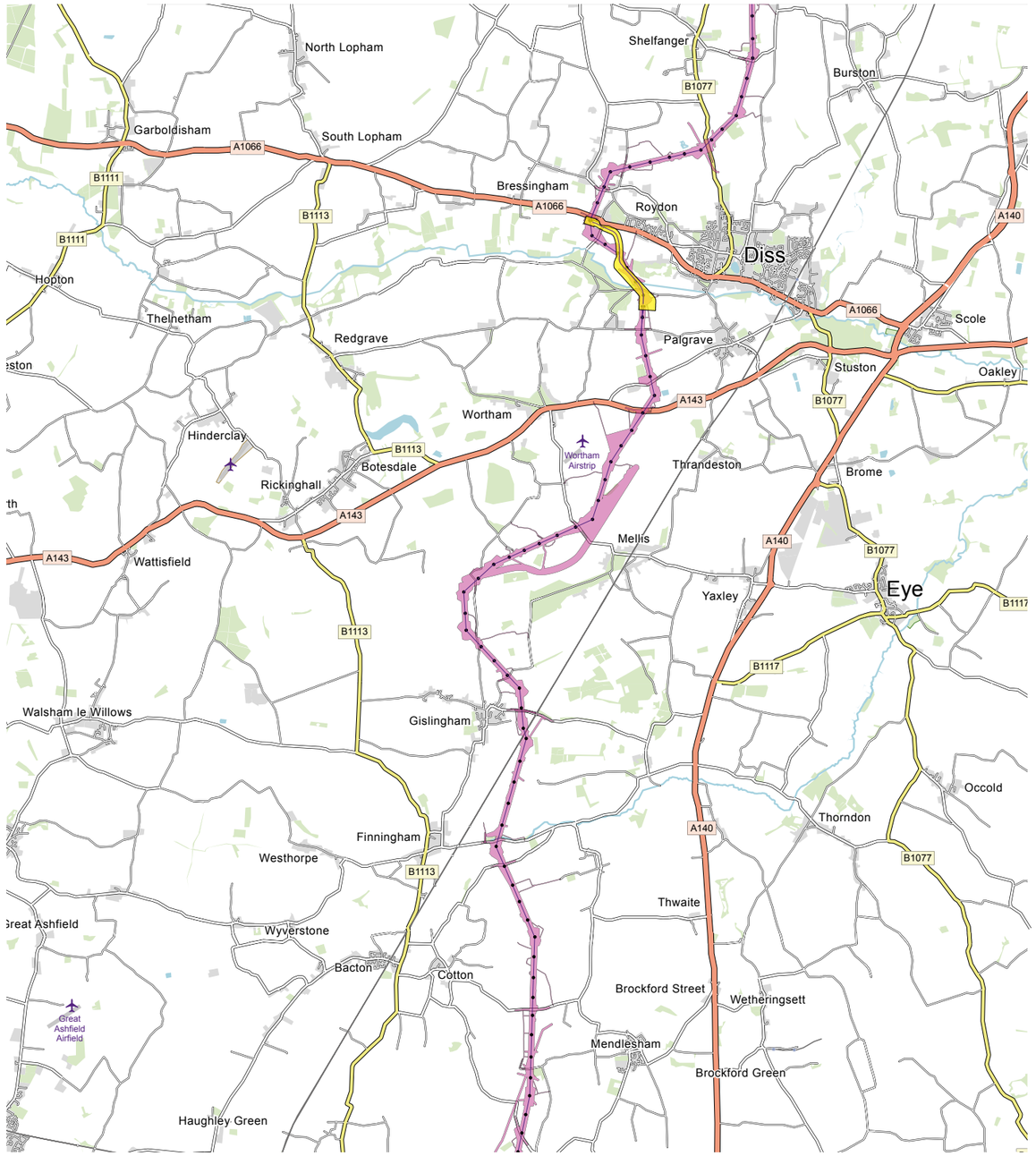
We are proposing a change to the 2023 preferred draft alignment between RG195 and RG200 to avoid oversail of a business and respond to feedback to reduce effects on residential amenity.

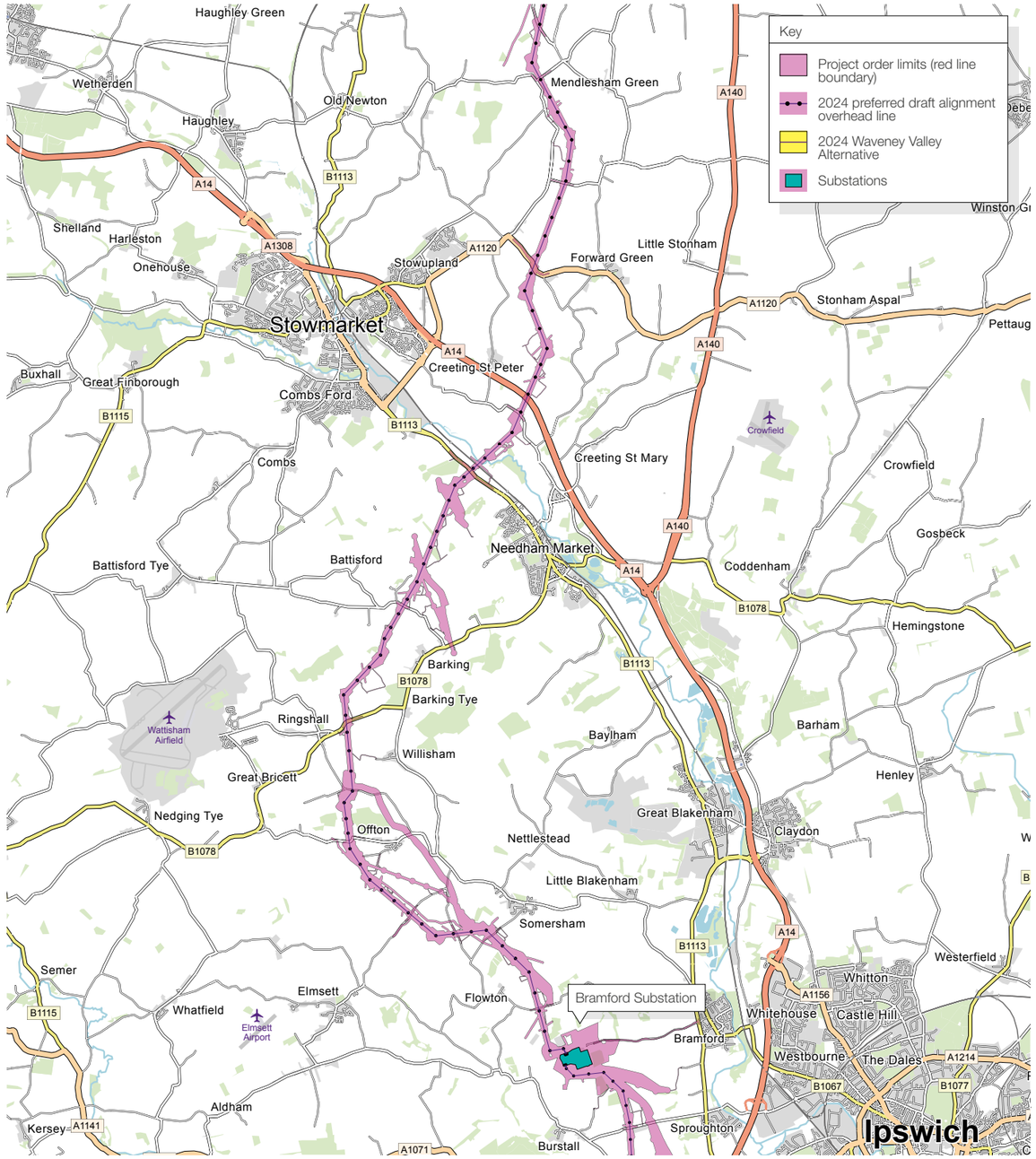
The overhead line is now proposed to continue south-east from RG191 before turning east crossing Blood Lane to the north of Bleak Hall before it rejoins the 2023 preferred draft alignment at RG200.

As a result of this change, we are also now proposing to replace part of the existing 132 kV overhead line from the north side of Offton Middle Wood through to the Bramford Substation with underground cable.

This would remove the need for multiple crossings of the existing 132 kV overhead line between Offton and Bramford and reduce the potential for cumulative effects.

Section B
Mid Suffolk





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Section C and D
Babergh, Tendring and Colchester

Section C and D 2024 preferred draft alignment

From Bramford Substation, the preferred draft alignment would cross immediately into the district of Babergh.

It would then run south-easterly, passing to the west of Washbrook and Copdock and north of Little Wenham and passing the north side of Raydon Airfield, where a change from overhead line to underground cable is made at a CSE compound moved from the edge of Notley Enterprise Park to a location with greater screening by woodland at Wenham Grove.

The underground cable would run to the east of Raydon and west of Holton St Mary as it enters the Dedham Vale National Landscape.

It would briefly cross the border into the Colchester district, running to the east of Langham and crossing the A12.

From here, the underground cable alignment would cross into the Tendring district, turning eastwards into the Tendring Peninsula, running north of Ardleigh and crossing the railway to the site of the East Anglia Connection Node (EACN) substation.

From the EACN substation, an overhead line would head west, crossing past Ardleigh and over the Ardleigh Reservoir and A12 towards Great Horkesley, where it would transition to underground cable at a CSE compound proposed to the north-east of Horkesley plantation. Cable continues to the west of Great Horkesley to a CSE compound near the junction of the B1508 and Crabtree Lane.

From here, the preferred draft alignment would continue south-west as an overhead line, passing to the west of West Bergholt, to the east of Fordham and Aldham, before crossing the A12, running north of Marks Tey and into the Braintree district.



Main changes in section C since the last consultation

Bramford to the Dedham Vale National Landscape

Following feedback to move the alignment away from residential properties and to reduce socio-economic effects, we are proposing a change to the 2023 preferred draft alignment.

This moves the alignment east of fishing lakes, with JC16 moving further to the west increasing the separation between the closest property around the Pigeons Lane and Spring Road junction from approximately 90 m to approximately 180 m.

North of the Dedham Vale National Landscape

Near Chattisham, we are proposing to move JC21 and JC22 to the north-east, moving JC22 further away from a public footpath and JC21 away from a field entry point.

To allow continued safe flight activities from Raydon airstrip and following additional information on potential effects on heritage assets at Little Wenham, we are now proposing that the CSE compound is moved to the north of Raydon Airfield where there is existing screening from woodland.

This change would move the preferred draft alignment further north away from Little Wenham and Great Wenham, extending the underground cable length by approximately 1.5 km.

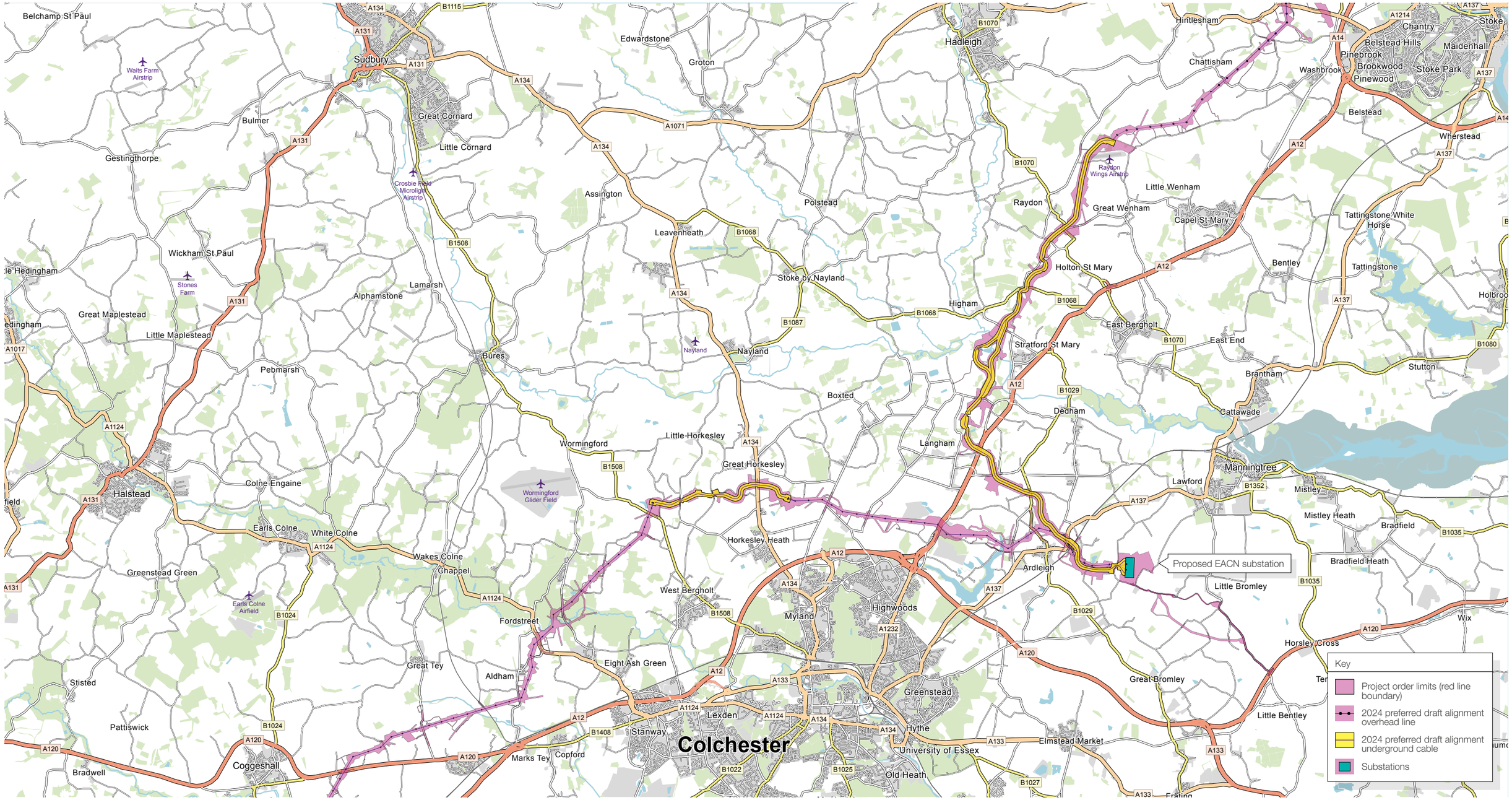
At the 2023 consultation we presented a split corridor for underground cable in the section near to Great Horkesley. Following feedback we have removed this split by restricting the working area for cable installation to reduce the potential for loss of woodland and interaction with a private garden. This moves the 2024 preferred draft alignment further south.

At Aldham we are also proposing a small change to move pylon positions around TB054, TB055 and TB056 to increase separation to residential properties.

Minor changes around Broad Green have been made in response to landowner feedback to position pylons at field edges where practicable.

Section C and D

Babergh, Tendring and Colchester



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Section E
Braintree

Section E 2024 preferred route alignment

After crossing into Braintree District, the preferred draft alignment would continue south-west, passing to the north of Witham and the south of Silver End before crossing the railway and heading south-west into Chelmsford district.

Main changes in section E since the last consultation

Little Tey to Fairstead

We are proposing a change at TB075, moving the pylon west to avoid a reservoir used for fishing. We have straightened the alignment and are proposing other changes to respond to landowner requests to position pylons at field edges and increase separation to residential properties.

We have also widened the order limits in this area to allow for routeing changes to respond to a possible allocation for mineral extraction that could be confirmed in 2024.

We are proposing a change from pylons TB89 (now TB88) to TB95 (now TB93) to move the preferred draft alignment to the western edge of the field.

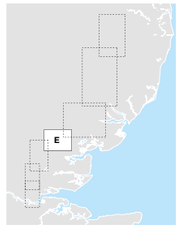
This change would also move the alignment further towards the western edge of Ruffian's Wood which, in combination with the positioning of a haul road to the east, would reduce effects on a business based at this woodland.

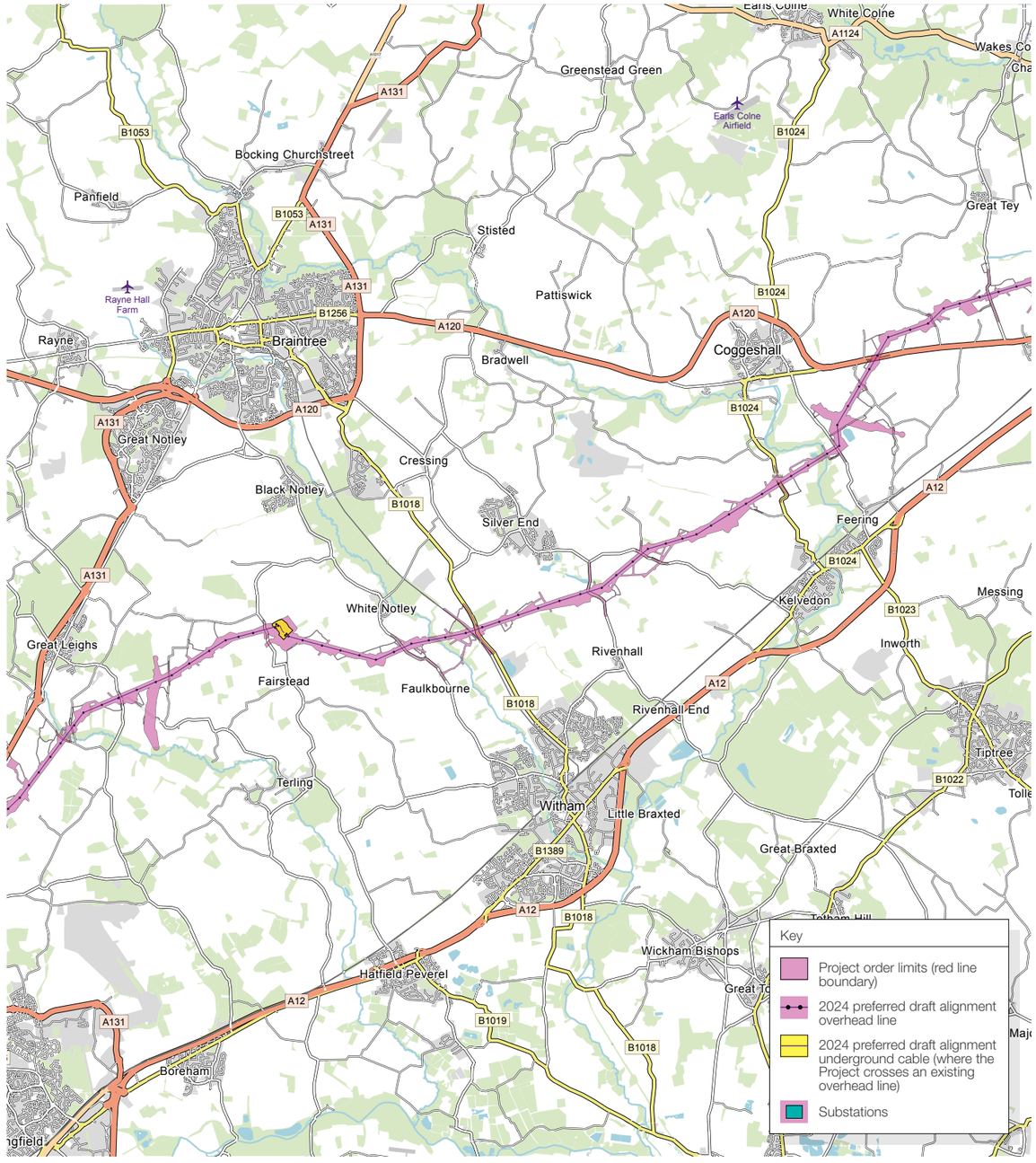
This change also allows the alignment and pylon positions to be positioned further away from a number of residential properties to the south of Silver End, some of which are listed.

At Fairstead

We are proposing to move the alignment further north with the CSE compounds located closer together within the same field. This would reduce the amount of underground cable required for the crossing of the existing 400 kV overhead line, reducing impacts on some trees. As a result of the repositioning of the western CSE compound, pylons TB111 to TB119 would be moved slightly further north and east and to the edges of fields where practicable.

The section of 132 kV overhead line which needs to be undergrounded to allow the crossing of the 400 kV alignment has been extended to the south of Fuller Street to reduce visual effects.





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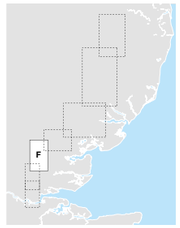
Section F
Chelmsford

Section F 2024 preferred alignment

The preferred draft alignment would enter the district from the north-east and run to the north of Chelmsford. From there it would head south on the western side of the town and to the west of Writtle before continuing south, passing to the west of Margaretting, and crossing over the A12 to the north of Ingatestone on the Brentwood district border.

Having crossed into Brentwood it would briefly cross back into Chelmsford in the vicinity of Buttsbury church.

Main changes in section F since the last consultation

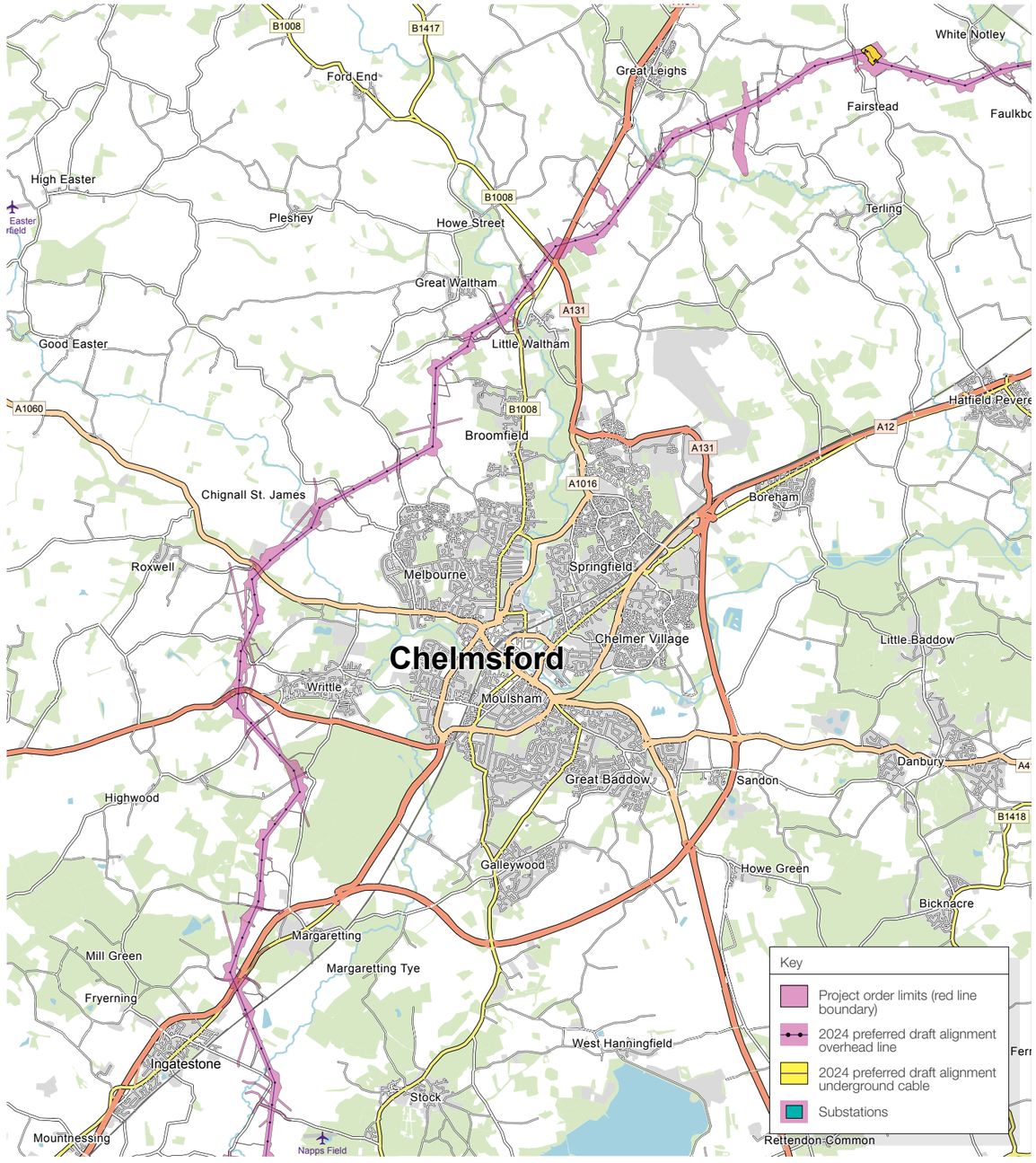


North of Little Waltham, we are proposing a change to the 2023 preferred draft alignment between TB130 and TB132 (now TB131 and TB133) which would move the alignment, including an angle pylon further south, away from residential properties.

We are also proposing a change to the 2023 preferred draft alignment near Broomfield between TB147 (now TB148) and TB154 (now TB155). This change is proposed to straighten the draft alignment and remove the angle pylon at TB150 and TB153.

The change moves TB152 to the north and east of its previous location further away from properties on Mashbury Road.

Other proposed changes in this section include moving TB160 further from residential properties and other pylons to field boundaries where practicable. Meanwhile, to the west of Margaretting, various adjustments are proposed to move pylons to field boundaries and avoid other constraints.



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Section G

Basildon and Brentwood (and Chelmsford east of Ingatestone)

Section G 2024 preferred draft alignment

Passing to the north and east of Ingatestone, the preferred draft alignment would cross the A12 and the railway in the north of the Brentwood district.

It would then travel directly south, crossing multiple times between the Chelmsford, Basildon and Brentwood districts. Passing to the east of Brentwood and the west of Billericay, the alignment would continue south, crossing the A127 and railway on the border of Thurrock District.

Main changes in section G since the last consultation

East of Ingatestone, a slight adjustment of TB193 to avoid a flood zone moves the pylon positions in the alignment slightly to the north and south and reduces the oversail at an animal rescue centre.

This also allows pylons to move to field boundaries (where practicable) responding to feedback to account for the size of modern farm machinery.

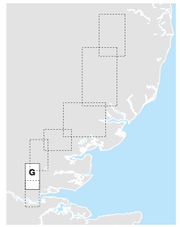
At Dunton Hills

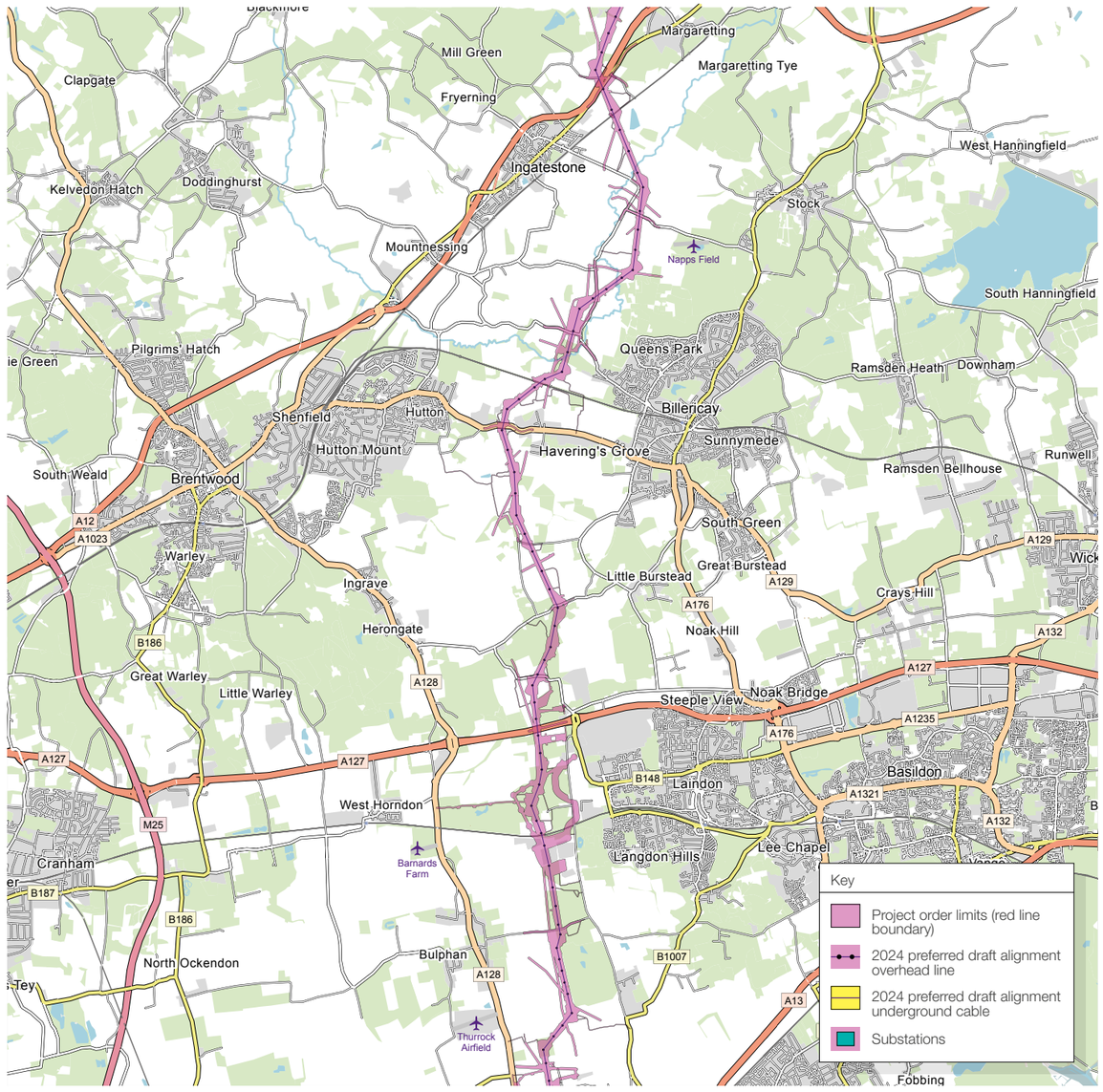
We are proposing changes to the east of Basildon to accommodate housing development proposals. This would reposition the route northwards from TB225 to more closely follow the gas pipeline.

This reduces effects on proposed housing developments in Brentwood and Basildon as well as on existing residential properties and listed buildings in the Dunton Wayletts area.

This change introduces some effect on a consented solar farm development. This could be reduced through detailed work to carefully position individual pylons (subject to certain technical considerations).

Associated with this change is the installation of a 132 kV cable connection to allow for the removal of the existing 132 kV overhead line from the Friern Manor Hotel to the south of the railway.





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Section H
Thurrock

Section H 2024 preferred draft alignment

The preferred draft alignment would continue south, passing Bulphan to the west and Horndon on the Hill to the east.

The overhead line would then head east, before going south to cross the A13 to the north-east of Southfields.

It would then head south to the west of Linford where it would transition to underground cable at a proposed CSE compound to the north of where the Lower Thames Crossing would be.

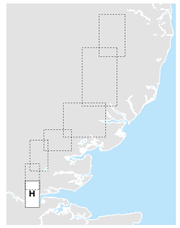
The underground cable alignment would then run south into Tilbury Substation.

We are proposing works at Tilbury Substation to connect Norwich to Tilbury into the substation, including building new infrastructure on the western half of the site on existing National Grid operational land.

Main changes in section H since the last consultation

Thurrock Airfield

Near Thurrock Airfield we have reduced pylon separations by introducing an additional pylon to keep pylon heights low. This change and maintaining positioning closer to Langdon Hills Golf and Country Club supports the continuation of flight activities at this airfield.





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4. Construction

Building Norwich to Tilbury would involve a range of construction activities, including preparing land and creating temporary haul roads to access work areas, as well as providing temporary areas to store materials, vehicles and staff welfare facilities.

Permanent access roads are also proposed in some areas for operation and maintenance requirements.

Building overhead lines

The first step in building overhead lines is to set up a working area where each new pylon will be built.

Foundations are laid, then the pylons are assembled in sections on the ground and craned into position. The number of sections for each pylon would vary according to the size and type of pylon being built.

Once the pylons are built, we hang the wires – or conductors – that carry the electricity. This is known as 'stringing'. We string a section of approximately ten pylons at a time. The conductor is pulled from one end to the other using large machinery.

The size, height, and spacing of pylons is determined by safety, topographical, operational and environmental considerations.

Installing underground cables

Most underground cables would be laid using open trench installation.

Underground cables are installed using ducts which protect and organise cables. Installing ducts means that trenches can be backfilled sooner and underground cables pulled into the ducts at a later date.



In some cases, other trenchless techniques such as micro-tunnelling, boring or Horizontal Directional Drilling (HDD) would be used where open trench installation is not appropriate. For example, when crossing features such as heavily trafficked highways, rivers or railways.

We are proposing to use an underground (trenchless) construction method in some areas of Norwich to Tilbury to install the underground cable. Trenchless crossing techniques allow us to install our underground cable while minimising interaction with the land surface, which reduces the impact on wildlife, traffic and local communities.

Temporary construction compounds

We need to set up temporary construction compounds to support construction activities.

These activities include material loading and unloading, material storage, vehicle parking, siting of welfare facilities, siting of construction cabins and modular offices.

We are proposing two main compounds and four smaller satellite compounds to support the overhead line construction.

A further twenty four compounds would support the installation of substations and underground cables, with further compounds required for the Waveney Valley Alternative. These would be located at each of the substation sites (Norwich Main, Bramford, EACN, and Tilbury), at each CSE compound location and spaced along the underground cable alignment itself.

The proposed siting of our compounds is designed to be close to primary access routes to reduce travel distances and the potential for environmental impacts. Once construction is completed, the temporary construction compounds would be removed and the ground reinstated.

As well as compounds, construction laydown areas and highway mitigation laydown areas would be required to store materials to support construction.

For more information on construction compounds, see the Preliminary Environmental Information Report (PEIR).



Primary access routes (PAR) and haul roads

PARs are public roads which have been identified to route construction vehicles and HGVs.

They have been identified considering existing highway constraints and avoiding settlements or other sensitive locations where practicable. PARs would connect to a trunk road network along the preferred draft alignment by new site access points which would then connect to haul roads.

Haul roads would be needed to transport all the machinery and materials safely from the public roads to the sites where we would be carrying out construction activities.

Where a haul road connects to the existing public highway, we would need to build a site access point known as a bellmouth junction. These are normally built from the side of fields to minimise disruption to highways.

In most cases for Norwich to Tilbury, haul roads would run alongside the proposed route alignment and in some locations we are proposing use of existing tracks and field boundaries. Where there are environmentally sensitive locations and businesses, we are proposing to divert haul road routes around them wherever practicable. In places we may be seeking highway powers to regulate the movement of vehicles.

East Anglia Connection Node (EACN) substation access

We would require temporary and permanent access roads for the proposed new EACN substation.

Temporary roads would be required for construction purposes. We are working closely with North Falls and Five Estuaries to consider both projects' substations and underground cable connections, and to explore options for a shared temporary access road, which would involve widening parts of Bentley Road and Ardleigh Road. We are also engaging with local authorities as part of this process.

A permanent private access road is also proposed for maintenance and operation requirements. This would connect widened parts of Bentley Road and Ardleigh Road to the south west of Little Bromley.

Cable Sealing End (CSE) Compound access

Each CSE compound would require temporary access roads for construction and permanent access for operation and maintenance requirements.



Find out more

We have produced 'Best Practice' guides which show how National Grid constructs overhead lines and underground cables.

You can view these guides on the Project website. While we would adopt the best practice as set out in these documents wherever it is possible and reasonably practical, there will be some instances where we cannot do this.

The Preliminary Environmental Information Report (PEIR) considers the likely significant effects of our proposals on the environment, along with the measures we are proposing to mitigate these impacts.

5. Managing and mitigating effects

Norwich to Tilbury is an Environmental Impact Assessment (EIA) development, as defined by the EIA Regulations. As part of the consultation, we are asking for feedback on the potential environmental effects of the proposals and if consultees have suggestions for reducing these effects (for example, through mitigation measures).

Some specific mitigation measures we are proposing include:

- planting for ecological and landscape screening around the EACN Substation and CSE compound sites
- adopting existing overhead line alignment near Mellis
- extending the removal of overhead line between three crossings of an existing line from Offton to Bramford substation
- extending the removal of two overhead lines to the south-east of Bramford Substation
- extending removal at a crossing of an existing overhead line near Fuller Street.

Biodiversity Net Gain

We will also be required to ensure a 10 per cent biodiversity Net Gain (known as BNG).

This means our work needs to result in more, or better quality, natural environment than before development.

This opens up real opportunities to use development to enhance our wild spaces and provide new habitats.

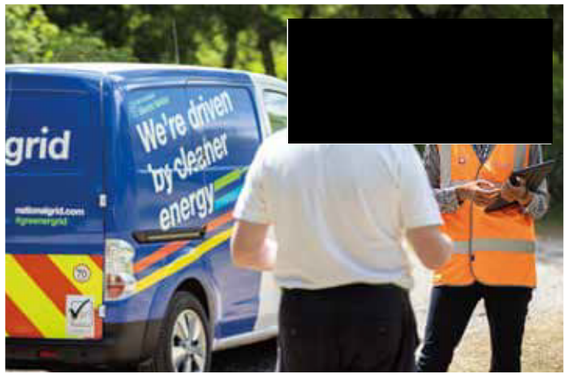
Where to find out more?

More information on managing and mitigating effects is detailed in the Preliminary Environmental Information Report (PEIR), Non-Technical Summary (NTS) of the PEIR and the Design Development Report 2024.

An Environmental Statement will be prepared in accordance with the EIA Regulations and will accompany the application for development consent.







Cumulative impacts

We are aware that National Grid and other organisations are developing energy and network proposals in the area.

Wherever possible we work collaboratively with other developers to consider their proposals and adjust our plans accordingly.

We are also aware of the impacts that multiple projects coming forward can have for local communities, and this collaborative working aims to reduce impacts where practicable and lead to more efficient ways of working.

6. Other information

Information for landowners

To enable Norwich to Tilbury to go ahead, we would need to temporarily make use of some land for construction activities or for permanent infrastructure.

We are committed to developing successful working relationships with landowners to acquire the rights to use this land through private negotiations. We have identified the land we would wish to use for our current proposals and have written to the owners.

Should it not be possible to reach agreement to acquire land by private treaty, we will apply for powers of compulsory purchase or rights of access as part of our application for development consent. If you believe you have a legal interest in any of the land required for our proposals and have not been approached by our agents, please contact us.

Surveys

As we work to develop our proposals, we have undertaken surveys in areas close to the route.

This includes ecology and habitat surveys, as well as Ground Investigation (GI) studies, which include borehole drilling, trial pit digging and monitoring activities.

Some of these surveys will continue as we work to finalise our application for development consent for the Project and assess conditions for construction.

We encourage landowners to contact us if they have any queries about how their land may be affected.

Since the consultation in 2023, our land referencing company TerraQuest has been making enquiries to identify and confirm all relevant land interests. TerraQuest has issued a Landowner Interest Questionnaire (LIQ) to people with an interest in land, to ensure the correct information is held relating to each parcel of land.

Contact our Lands Team

If you feel your land may be affected by the proposals, please contact the Norwich to Tilbury Lands Team at Fisher German by emailing **Norwich-Tilbury@fishergerman.co.uk** or by calling us on Freephone **0808 175 3314**.

Alternatively, you can write to **Norwich to Tilbury Lands Team at Fisher German, The Atrium, Risby Business Park, Newmarket Road, Risby, Bury St Edmunds, IP28 6RD**.

More detailed information for landowners, along with contact information can be found on the **Landowner page** of our Project website.



7. Next steps

The feedback we receive at this stage of consultation, along with outputs from technical assessments and environmental surveys, will shape the development of our proposals for Norwich to Tilbury.

Following this consultation, we will:

- consider all consultation feedback as we refine our proposals
- continue our discussions with landowners and people with an interest in land which interacts with the Project
- continue briefing local elected representatives
- continue working with communities, local authorities and other stakeholders
- continue carrying out environmental impact assessment work and undertaking surveys along the proposed route
- provide further updates to the local community and to those who have asked to be kept updated on our proposals via a community newsletter
- continue to refine our proposals in response to feedback and results from technical studies and surveys.

Following further development to finalise our detailed proposals, we propose to submit our DCO application, including a Consultation Report showing how we have taken account of feedback, to the Planning Inspectorate. The Planning Inspectorate will appoint an independent Examining Authority to examine our proposals and make a recommendation on the application to the Secretary of State for the Department of Energy Security and Net Zero, who will make the final decision on whether or not to grant development consent.

To learn more about our proposals:

- Read this Project Background Document
- Visit an inspection point (see Table three)
- Visit our website at: nationalgrid.com/norwich-to-tilbury
- Sign up to receive project update emails (visit our website)
- Come to a public information event (see Table one)
- Call our freephone 0800 915 2497 between 9am and 5:30pm
- Join an online webinar session (see Table two)
- Email us: contact@n-t.nationalgrid.com

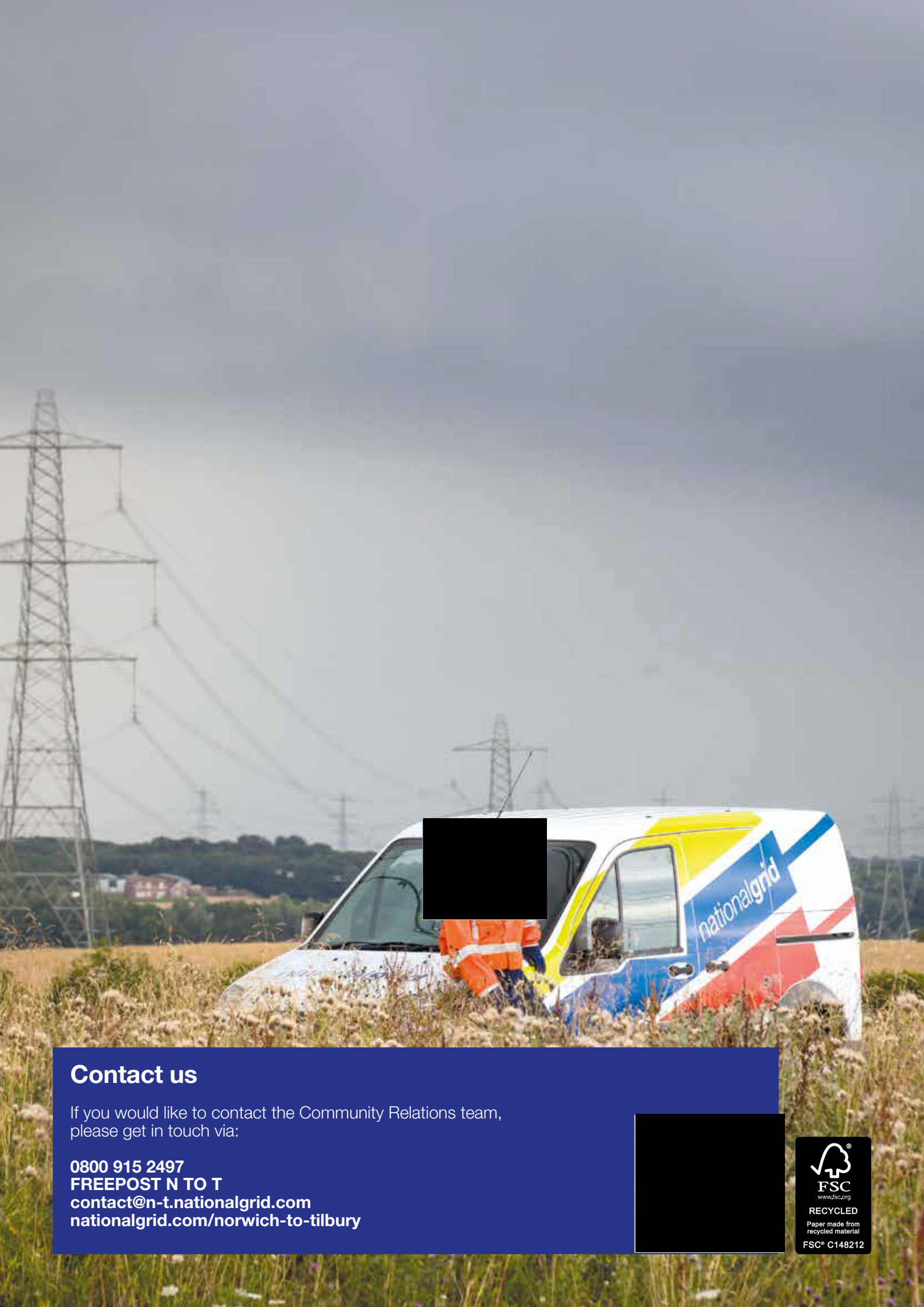




To respond to the Norwich to Tilbury consultation:

- Complete the feedback questionnaire on our website nationalgrid.com/norwich-to-tilbury
- Post your written responses (no stamp required) to: FREEPOST N TO T
- Email your comments to: contact@n-t.nationalgrid.com
- Complete a printed feedback questionnaire and return it using the freepost address

Your comments must be received by 11:59 pm on 18 June 2024.



Contact us

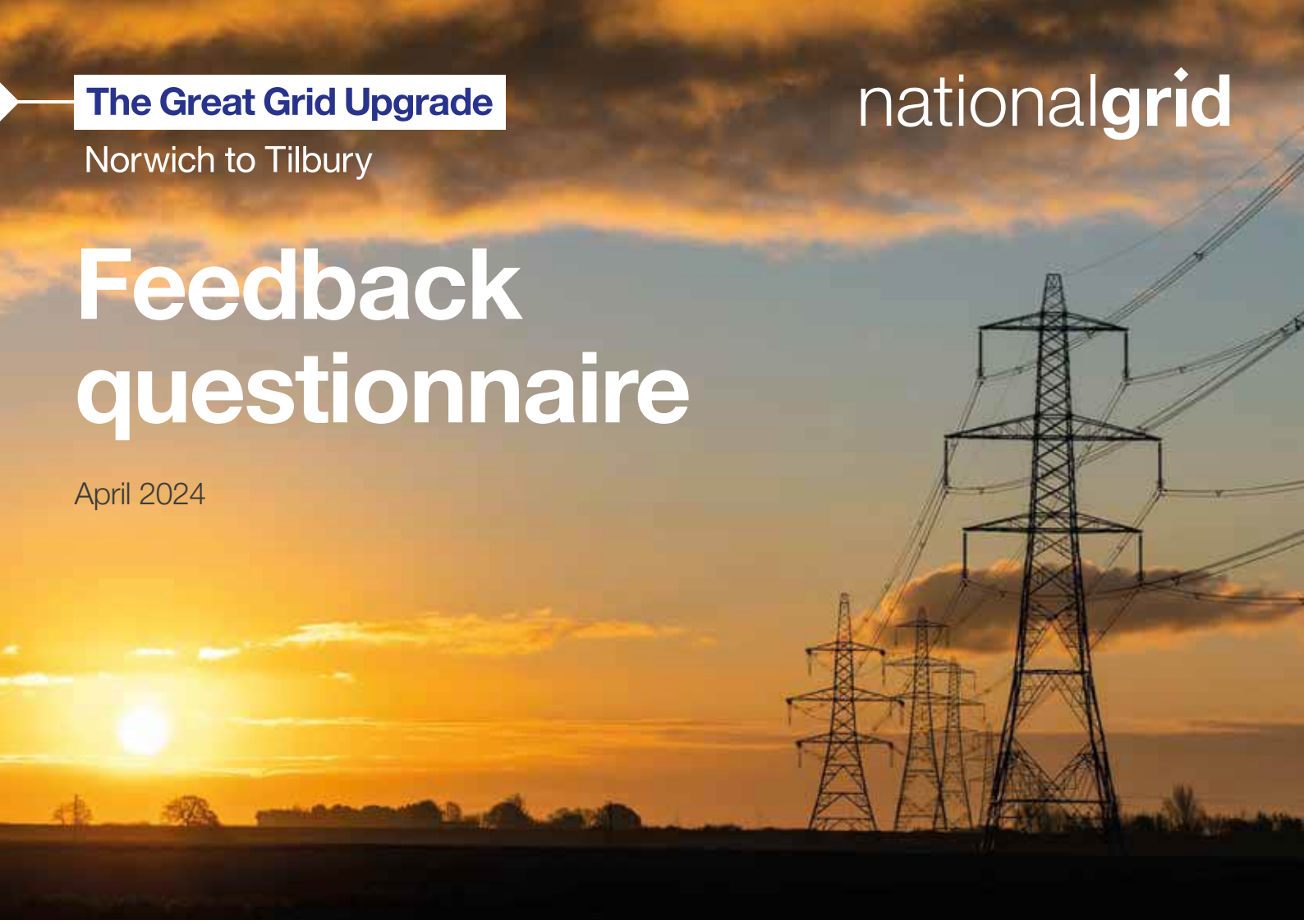
If you would like to contact the Community Relations team, please get in touch via:

0800 915 2497
FREEPOST N TO T
contact@n-t.nationalgrid.com
nationalgrid.com/norwich-to-tilbury

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Appendix I14

Questionnaire



The Great Grid Upgrade

Norwich to Tilbury

nationalgrid

Feedback questionnaire

April 2024

Our statutory consultation

National Grid Electricity Transmission (National Grid) is consulting on proposals to upgrade the transmission network between the existing substations at Norwich Main in Norfolk, Bramford in Suffolk and Tilbury in Essex.

This is our third public consultation on our proposals for Norwich to Tilbury (the Project). It is called a statutory consultation because it is being carried out in line with the formal requirements of the Planning Act 2008.

It follows two previous non-statutory public consultations on our draft proposals which were held in 2022 and 2023.

This statutory consultation is open between **12.00 noon** on **Wednesday 10 April 2024** and **11.59pm** on **Tuesday 18 June 2024**.

Consultation is an important part of the Development Consent Order (DCO) process as it enables everyone to comment on the proposals, with feedback helping inform their development – along with technical assessments and environmental surveys – before we submit our DCO application to the Planning Inspectorate.

Our proposals

Our proposals have been revised in light of feedback received at previous non-statutory consultations in the spring of 2022 and in the summer of 2023.

More information on both non-statutory consultations and how the feedback received helped influence and shape the proposals can be found in the 2022 Non-statutory Consultation Feedback Report and the 2023 Non-statutory Consultation Feedback Report. These are available on the Project website.

As part of our statutory consultation we are asking for your feedback on all aspects of the Project, including:

- approximately 159 kilometres (km) of new overhead line supported on approximately 510 steel lattice pylons (typically around 50 m in height) some of which are gantries (typically up to 15 m in height) within proposed Cable Sealing End (CSE) compounds, or existing or proposed substations
- approximately 25 km of 400 kilovolt (kV) underground cabling, some of which is located through the Dedham Vale National Landscape (formerly known as Dedham Vale AONB)
- six new CSE compounds, each with a permanent access, to connect the overhead lines to the underground cables
- a new 400 kV East Anglia Connection Node (EACN) substation with a new permanent access on the Tendring Peninsula. This is proposed to be an Air Insulated Switchgear (AIS) substation
- substation extension works at the existing Norwich Main and Bramford substations, and works within the existing Tilbury Substation to connect and support operation of the new transmission connection
- temporary works associated with construction of the Project.

We would also need to divert and/or modify some third party utilities to facilitate the construction of the Project.

Land requirement

We would need to acquire land where we would site the permanent infrastructure, and would also need land on a temporary basis for construction activities, including working areas for construction equipment and machinery, site offices, welfare, storage and temporary construction access.

Additional land would be required for mitigation, compensation and enhancement of the environment including for Biodiversity Net Gain.

The Waveney Valley

An alternative design at the Waveney Valley (referred to as the Waveney Valley Alternative) is also being considered and is the subject of consultation and ongoing assessment.

This design alternative, if taken forward, would result in changes to some of the elements of the Project listed on page 2.

The proposals would include:

- installation of approximately 2 km of underground cabling (with 2 km of overhead line being removed from our baseline proposals)
- two CSE compounds (to join the high-voltage underground cables to the overhead line) with associated access roads. This would increase the number of CSE compounds from six to eight.

All other works not listed above would be the same as on page 2 for both the overhead line or underground cable designs in this area.

We are asking for feedback on both the overhead line proposals and the Waveney Valley Alternative at this consultation.

Preliminary Environmental Information Report

We are also consulting on the preliminary findings from our environmental studies and assessments as well as preliminary mitigation proposals.

Full details of this can be found in our Preliminary Environmental Information Report (PEIR).

Knowing what matters to you matters to us. Your feedback is important in helping us finalise our plans for Norwich to Tilbury.

Further information

We have published further information on Norwich to Tilbury including:

- Project Background Document
- 2023 Non-statutory Consultation Feedback Report
- Preliminary Environmental Information Report (PEIR) and non-technical summary (NTS) of the PEIR
- 2024 Strategic Options Backcheck and Review
- 2024 Design Development Report
- Project maps / Project area maps showing the extent of the proposed Project
- Community Newsletter
- Statement of Community Consultation (SoCC)

These documents, along with others, are available on our website to help inform your feedback. Our website, nationalgrid.com/Norwich-to-tilbury, also includes an interactive Project map.

If you wish to receive paper copies of these documents or need them in another format, please get in touch by freephone on 0800 915 2497 or by email at contact@n-t.nationalgrid.com (please note a reasonable charge may apply for printing and posting costs).



Changes to the Project

Feedback received during our 2023 non-statutory consultation has resulted in a number of changes to the Project, so it's important to review our plans carefully even if you have previously provided feedback.

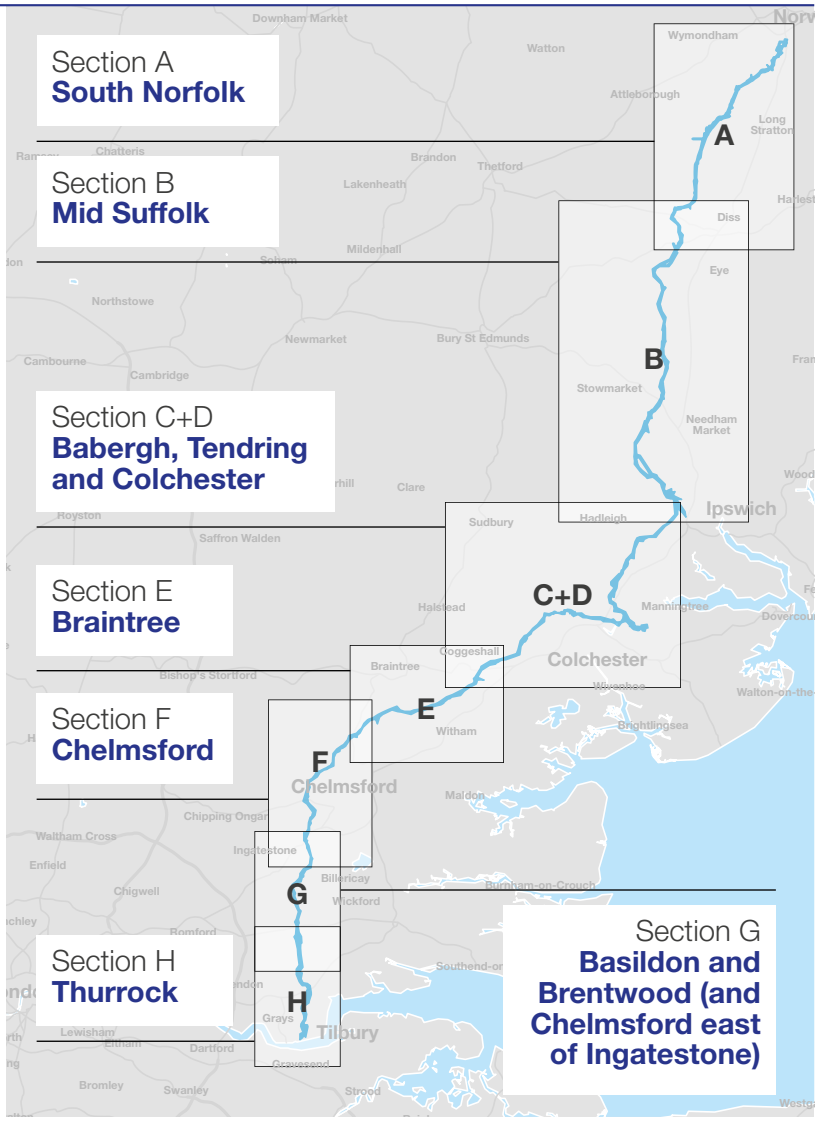
These changes vary in scale and can include adjustments to the proposed locations of pylons, overhead line and underground cabling along the route.

Information on the route and potential changes can be found in the **Project Background Document, 2024 Design Development Report**, and the **Preliminary Environmental Information Report (PEIR)**, all of which can be found on our website at **nationalgrid.com/norwich-to-tilbury**.

How to provide feedback

We have divided the route into sections A-H. These sections are described in more detail in the Project Background Document.

This feedback questionnaire includes questions about each section of the route as set out below. You are welcome to answer all or only some of the questions, depending on which locations and issues are most important to you. There is also space to comment generally about the Project and this consultation.



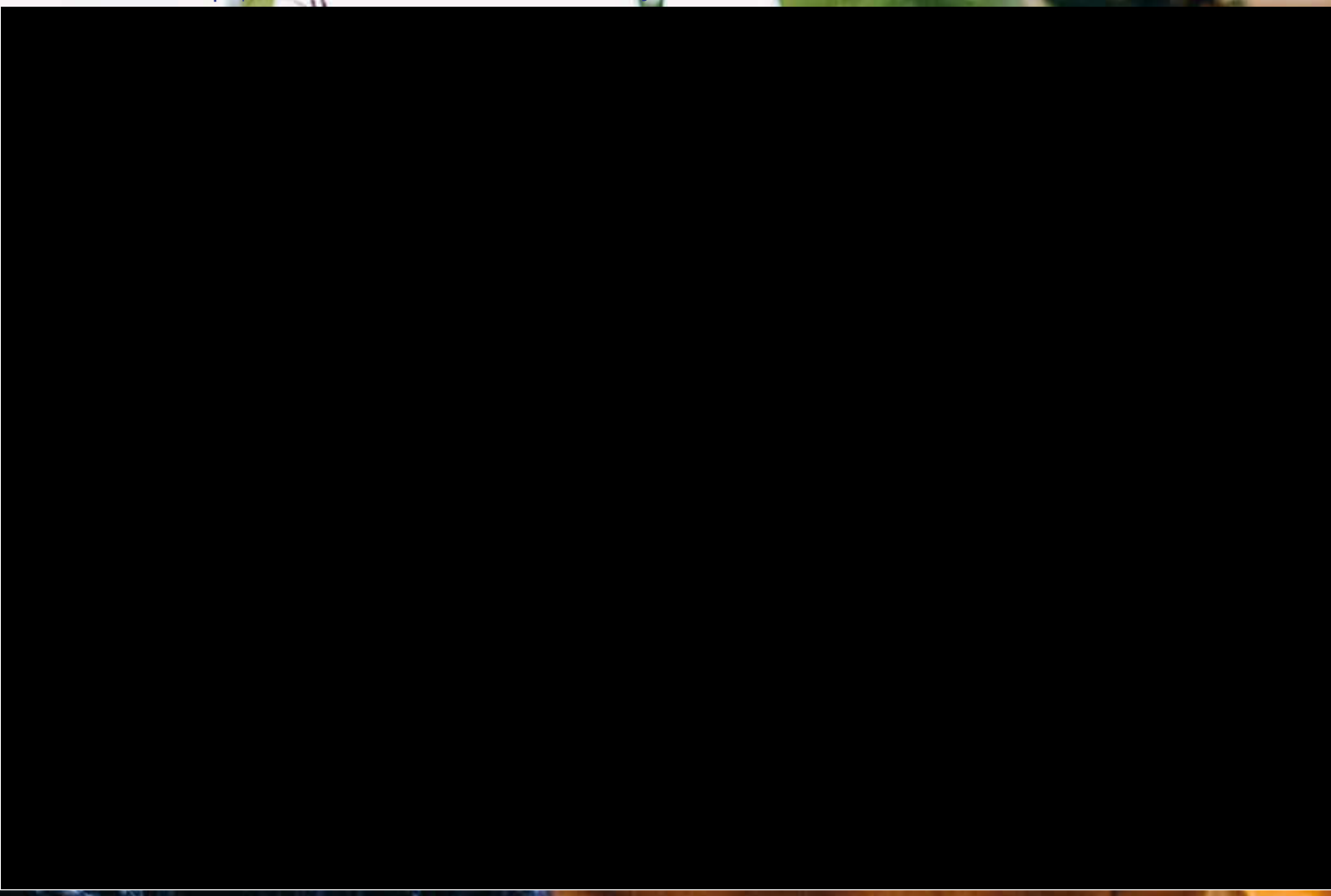
Identifying the locations of specific pylons and other infrastructure

Where possible, we encourage you to refer to specific locations that are most important to you.

Project maps / Project area maps and the interactive Project map provide the numbers we are using to identify pylons which will help you to provide feedback. These can be viewed at the public information events and on the Project website.

A Guide to Interacting with our Consultation Plans has also been published to help you navigate to the maps and plans most relevant to you.

You can provide feedback by completing this feedback questionnaire and sending it back to us at FREEPOST N TO T. You can also also provide feedback by emailing us at contact@n-t.nationalgrid.com or by completing the feedback questionnaire online at: nationalgrid.com/norwich-to-tilbury.





About you:

Name:

Organisation/Group (if applicable):

Address:

Postcode:

Email address:

☐ Please tick here if you would like to be updated on our proposals via email.

Q1. How would you describe your interest in Norwich to Tilbury?

☐ Local resident

☐ Local representative (e.g. Councillor, MP)

☐ Potentially affected landowner or tenant/ occupier (please include your landowner reference number if known)

☐ Local business owner

☐ Regular visitor

☐ Local interest group member (please specify in the text box below)

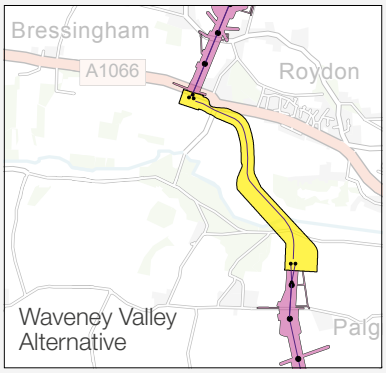
☐ Statutory organisation (please specify in the text box below)

☐ Other (please specify in the text box below)

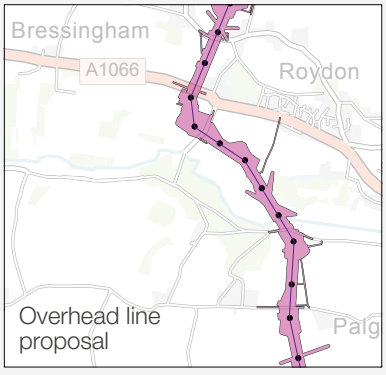
Section A **South Norfolk**

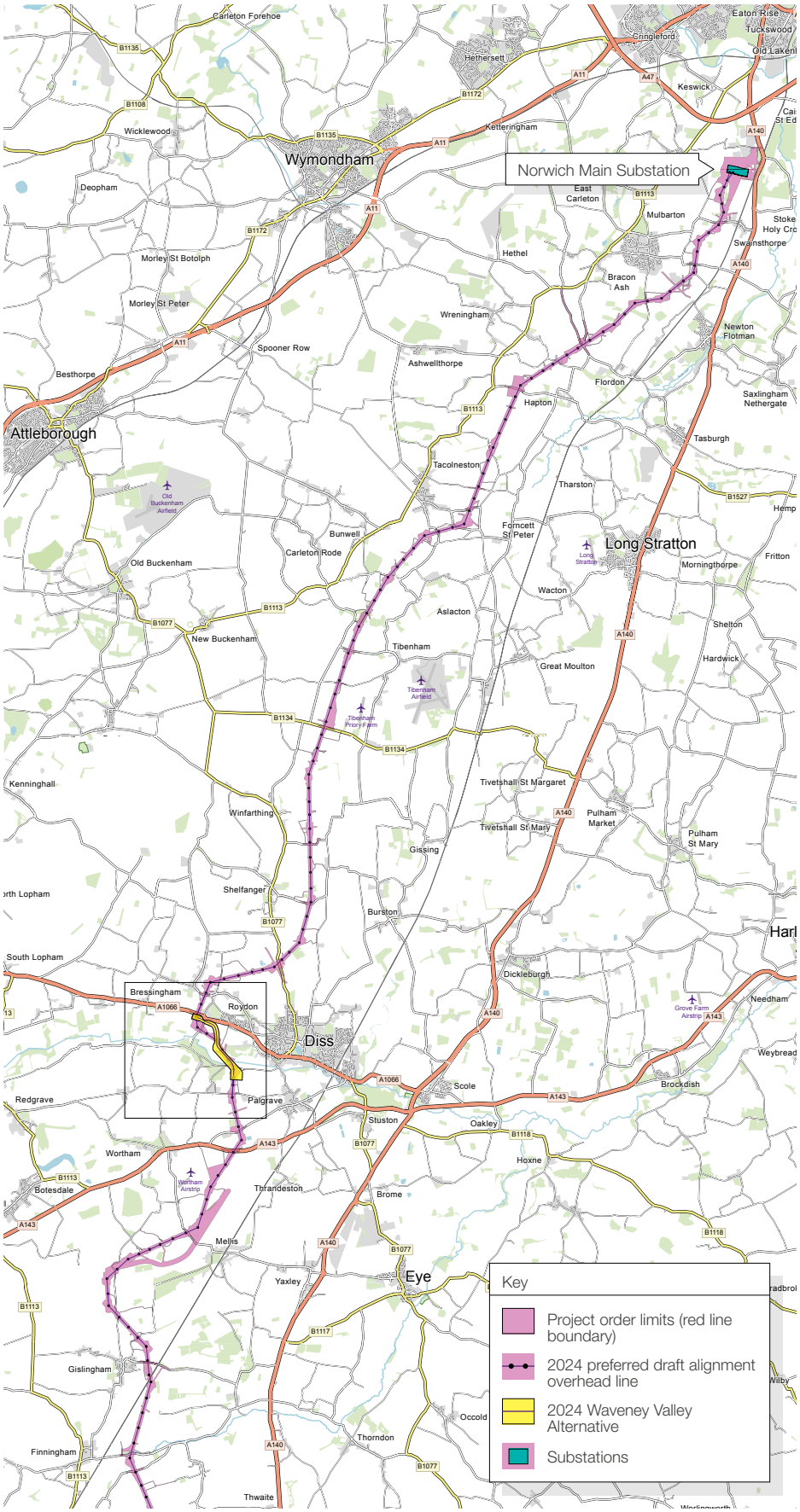
Please refer to the Project Background Document, the 2024 Design Development Report and Preliminary Environmental Information Report (PEIR) for more information on our proposals in this section, including changes made since the last consultation.

In response to feedback from the 2023 non-statutory consultation, we are considering proposals for a section of underground cables which we are calling the **Waveney Valley Alternative**.



This alternative would include the installation of approximately 2 km of underground cabling (and the substitution of 2 km of overhead lines from our proposals) and two additional CSE compounds (to join the high-voltage underground cables onto the overhead line) with associated access roads.





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Q2. Do you have any comments on the following within this section?

- Proposed overhead line alignment.
- Proposed pylon locations (if you would like to comment on specific pylon locations, please refer to the numbering in the Project maps / Project area maps, 2024 Design Development Report and the interactive Project map, which can be found at nationalgrid.com/norwich-to-tilbury).
- Works to connect the proposed new overhead line into the existing Norwich Main Substation.
- Our proposals for construction, including temporary and permanent access roads and tracks, compounds and associated infrastructure.
- Changes we have made to the Project in this area since the 2023 non-statutory consultation.

Q3. Do you have any comments on both alternatives being presented at the Waveney Valley?

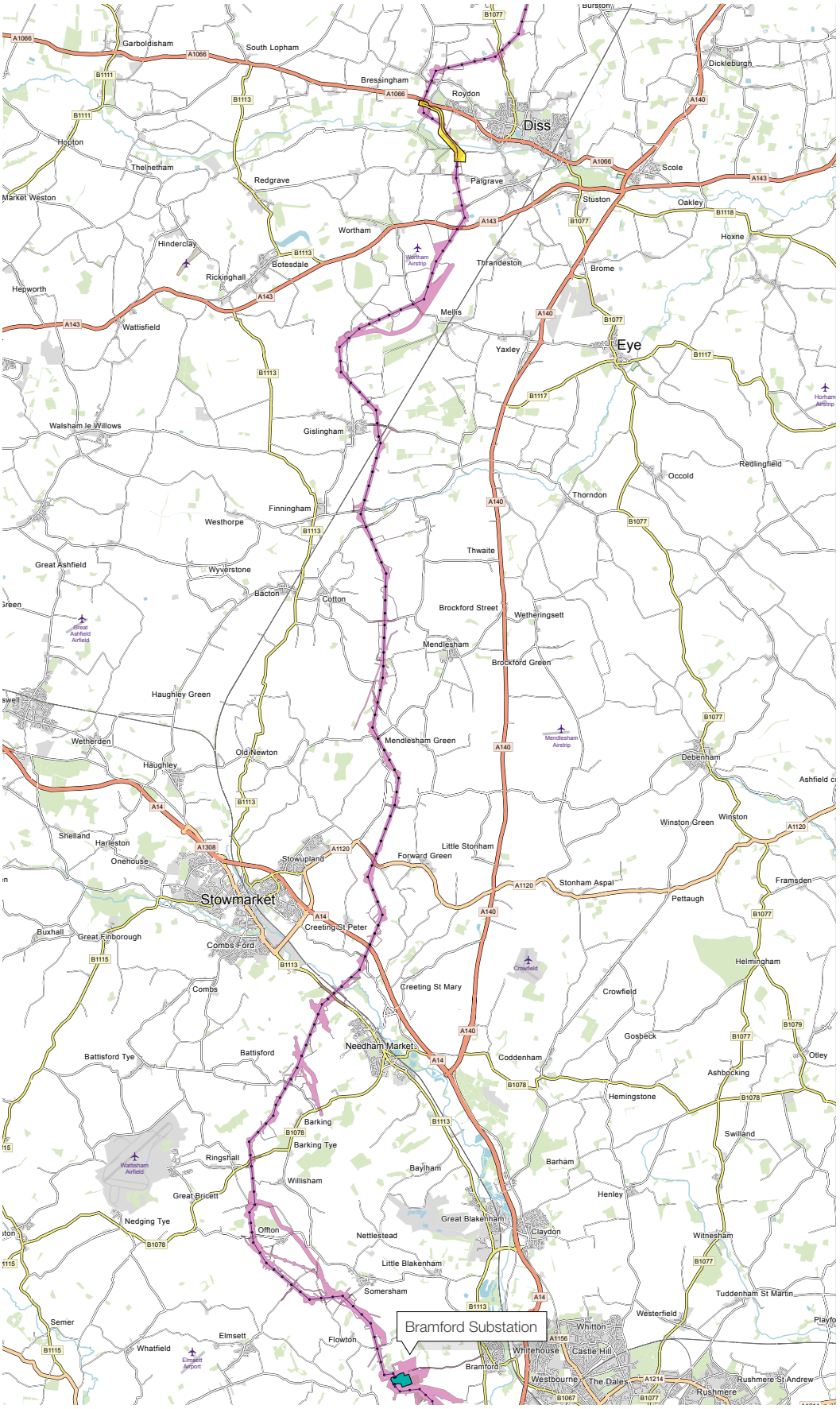
Q4. Do you have any further comments on our proposals in this section?

Section B **Mid Suffolk**

Please refer to the Project Background Document, the 2024 Design Development Report and Preliminary Environmental Information Report (PEIR) for more information on our proposals in this section including changes made since the last consultation.

Key

- Project order limits (red line boundary)
- 2024 preferred draft alignment overhead line
- 2024 Waveney Valley Alternative
- Substations



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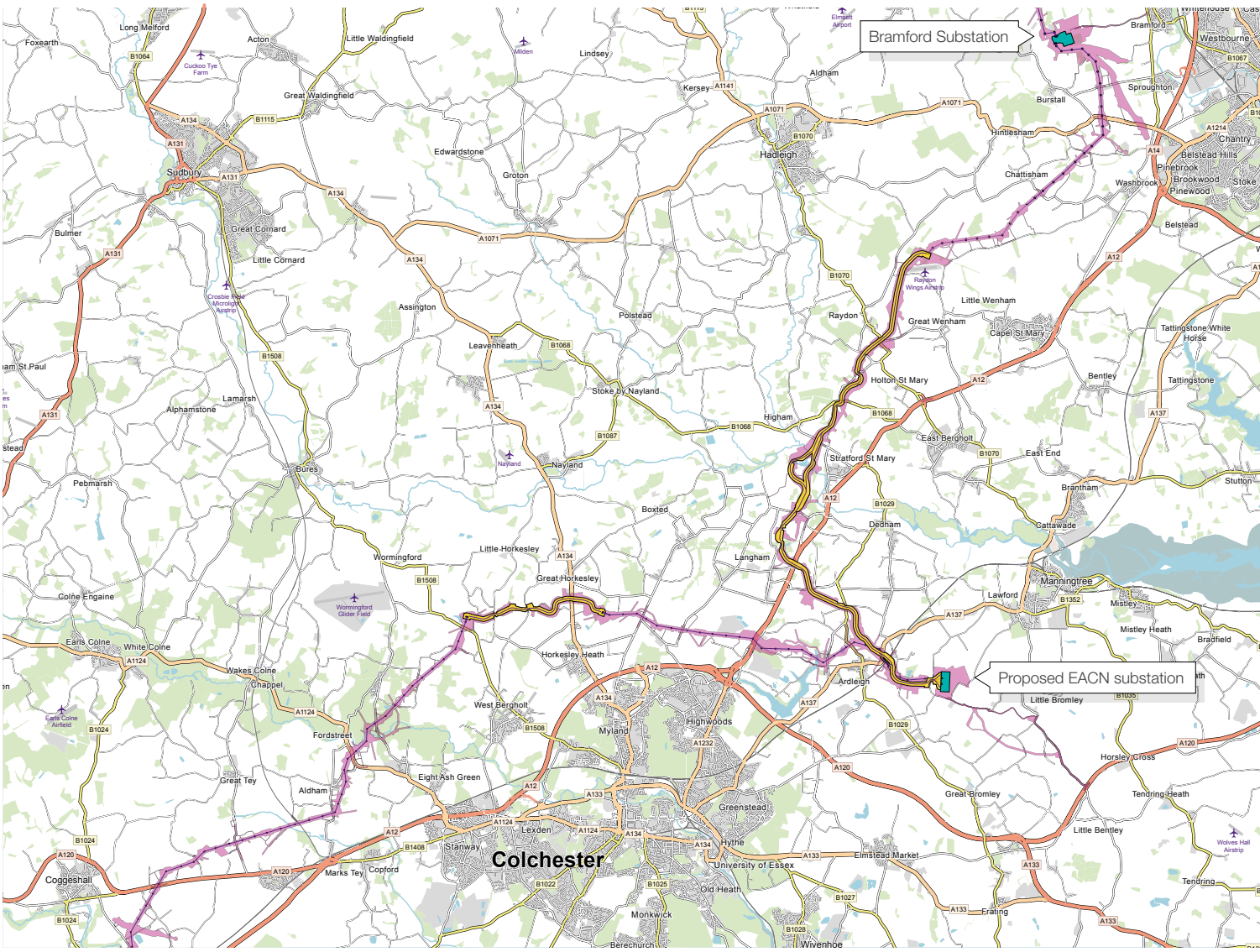
Q5. Do you have any comments on the following within this section?

- Proposed overhead line alignment.
- Proposed pylon locations (if you would like to comment on specific pylon locations, please refer to the numbering in the Project maps / Project area maps, 2024 Design Development Report and the interactive Project map, which can be found here nationalgrid.com/norwich-to-tilbury).
- Works to connect the proposed new overhead line in and out of the existing Bramford Substation.
- Our proposals for construction, including temporary and permanent access roads and tracks, compounds and associated requirements.
- Changes we have made to the Project in this area since the 2023 non-statutory consultation.

Q6. Do you have any comments on both alternatives being presented for the Waveney Valley area?

Q7. Do you have any further comments on our proposals in this section?

Section C and D **Babergh, Tendring and Colchester**



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Please refer to the Project Background Document, the 2024 Design Development Report and Preliminary Environmental Information Report (PEIR) for more information on our proposals in this section including changes made since the last consultation.

Key

- Project order limits (red line boundary)
- 2024 preferred draft alignment overhead line
- 2024 preferred draft alignment underground cable
- Substations

Q8. Do you have any comments on the following within this section?

- Proposed overhead line alignment.
- Proposed pylon locations (if you would like to comment on specific pylon locations, please refer to the numbering in the Project maps / Project area maps, 2024 Design Development Report and the interactive Project map, which can be found here nationalgrid.com/norwich-to-tilbury).
- Proposed underground cable locations.
- Proposed CSE compound locations.
- Proposed East Anglia Connection Node (EACN) substation.
- Our proposals for construction, including temporary and permanent access roads and tracks, compounds and associated requirements.

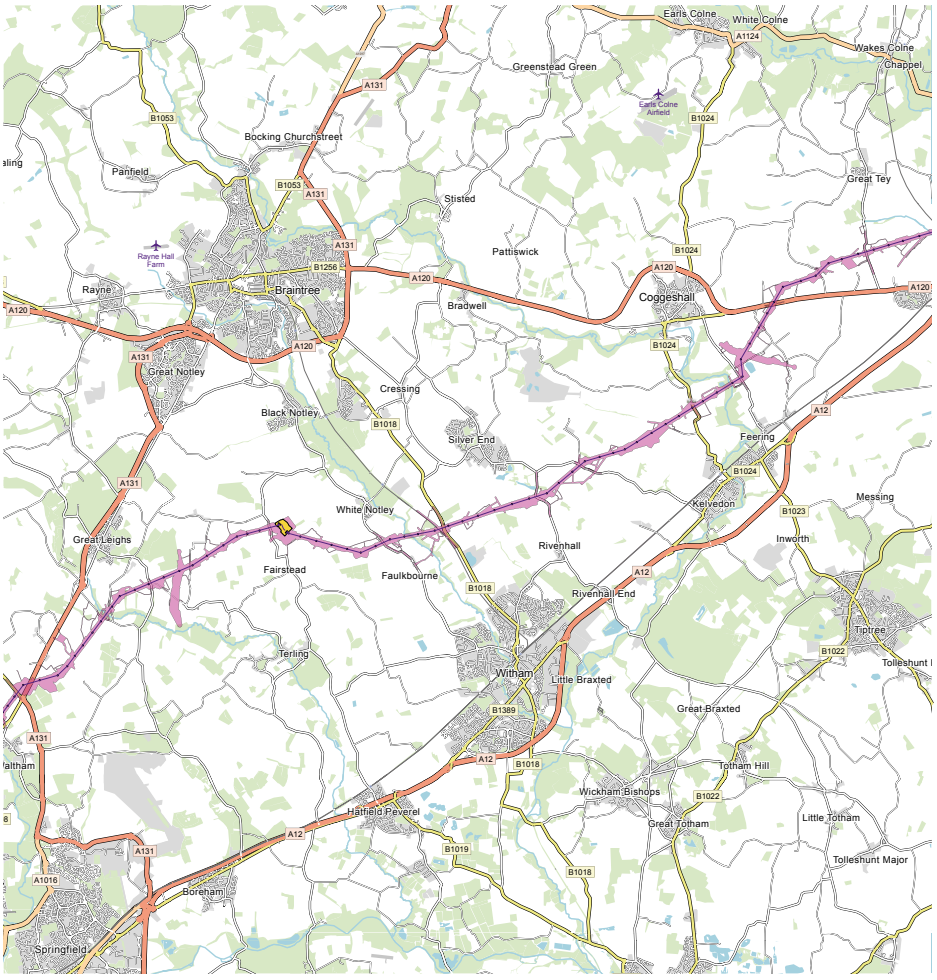
Q9. Do you have any further comments on our proposals in this section?

Section E **Braintree**

Please refer to the Project Background Document, the 2024 Design Development Report and Preliminary Environmental Information Report (PEIR) for more information on our proposals in this section including changes made since the last consultation.

Key

- Project order limits (red line boundary)
- 2024 preferred draft alignment overhead line
- 2024 preferred draft alignment underground cable (where the Project crosses an existing overhead line)
- Substations



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Q10. Do you have any comments on the following within this section?

- Proposed overhead line alignment.
- Proposed pylon locations (if you would like to comment on specific pylon locations, please refer to the numbering in the Project maps / Project area maps, 2024 Design Development Report and the interactive Project map, which can be found here nationalgrid.com/norwich-to-tilbury).
- Proposed underground cable locations.
- Proposed CSE compound locations.
- Our proposals for construction, including temporary and permanent access roads and tracks, compounds and associated requirements.

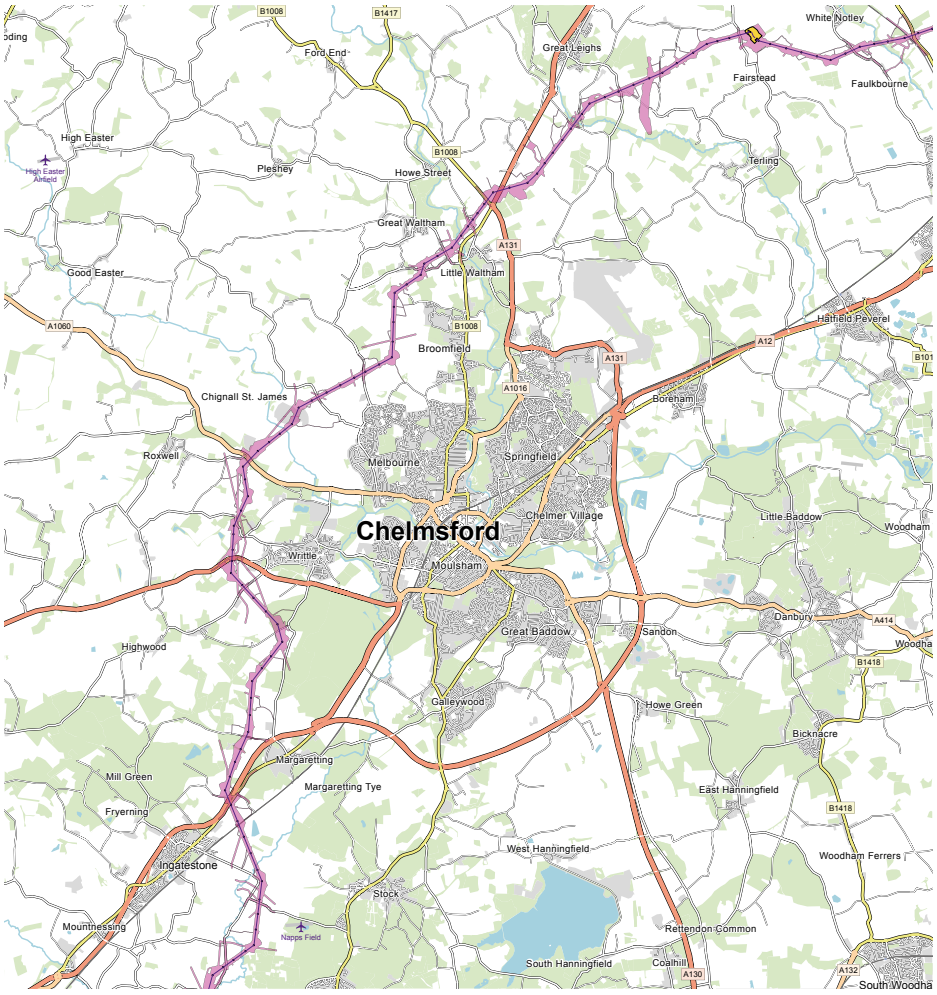
Q11. Do you have any further comments on our proposals in this section?

Section F **Chelmsford**

Please refer to the Project Background Document, the 2024 Design Development Report and Preliminary Environmental Information Report (PEIR) for more information on our proposals in this section including changes made since the last consultation.

Key

- Project order limits (red line boundary)
- 2024 preferred draft alignment overhead line
- 2024 preferred draft alignment underground cable
- Substations



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Q12. Do you have any comments on the proposed locations for the following within this section?

- Proposed overhead line alignment.
- Proposed pylon locations (if you would like to comment on specific pylon locations, please refer to the numbering in the Project maps / Project area maps, 2024 Design Development Report and the interactive Project map, which can be found here nationalgrid.com/norwich-to-tilbury).
- Our proposals for construction, including temporary and permanent access roads and tracks, compounds and associated requirements.

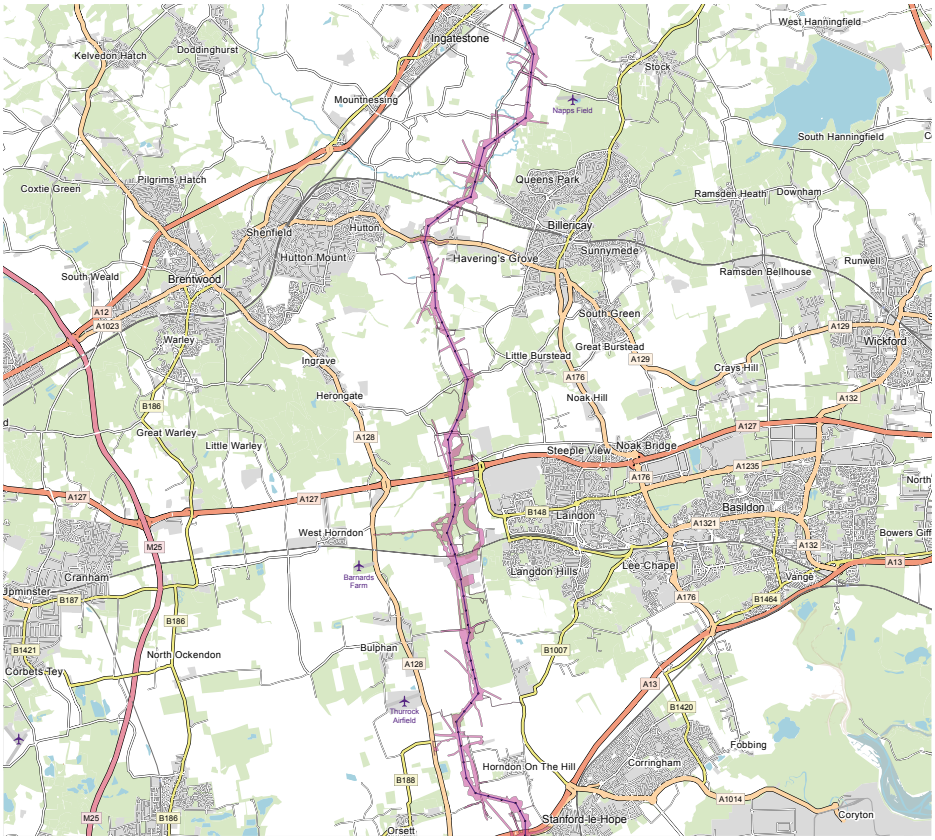
Q13. Do you have any further comments on our proposals in this section?

Section G **Basildon and Brentwood (and Chelmsford east of Ingatestone)**

Please refer to the Project Background Document, the 2024 Design Development Report and Preliminary Environmental Information Report (PEIR) for more information on our proposals in this section including changes made since the last consultation.

Key

- Project order limits (red line boundary)
- 2024 preferred draft alignment overhead line
- 2024 preferred draft alignment underground cable
- Substations



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Q14. Do you have any comments on the proposed locations for the following within this section?

- Proposed overhead line alignment.
- Proposed pylon locations (if you would like to comment on specific pylon locations, please refer to the numbering in the Project maps / Project area maps, 2024 Design Development Report and the interactive Project map, which can be found here nationalgrid.com/norwich-to-tilbury).
- Our proposals for construction, including temporary and permanent access roads and tracks, compounds and associated requirements.

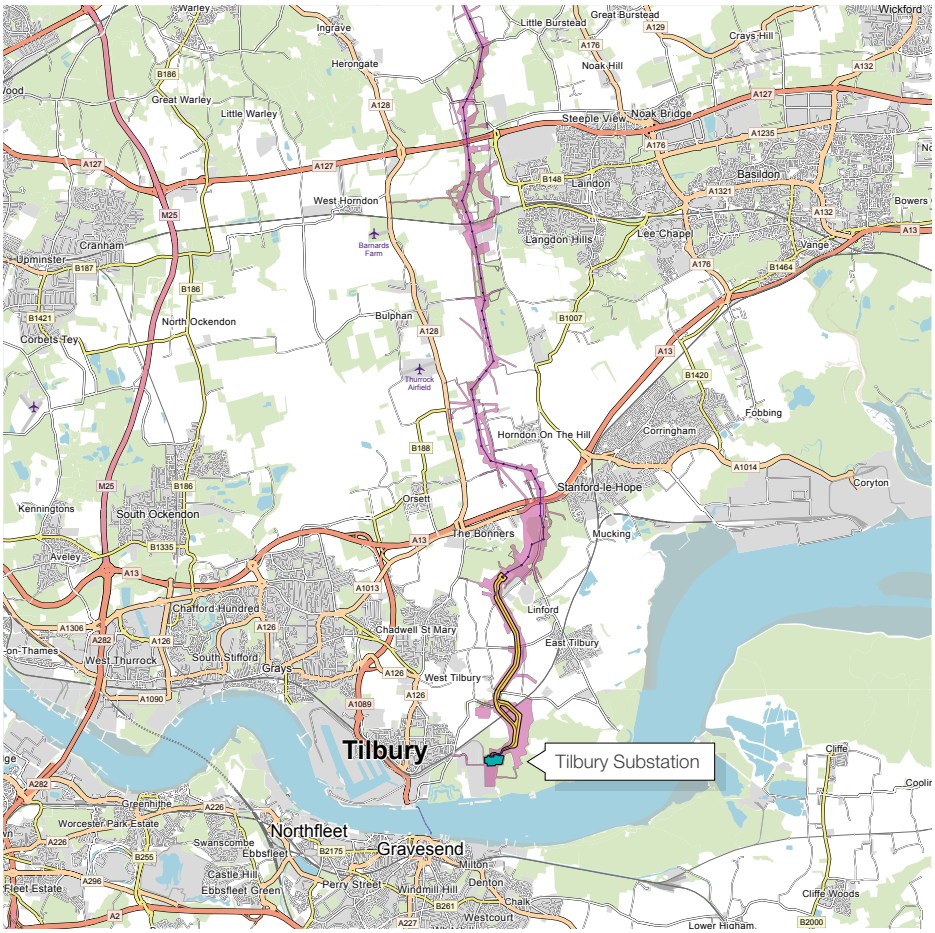
Q15. Do you have any further comments on our proposals in this section?

Section H **Thurrock**

Please refer to the Project Background Document, the 2024 Design Development Report and Preliminary Environmental Information Report (PEIR) for more information on our proposals in this section including changes made since the last consultation.

Key

- Project order limits (red line boundary)
- 2024 preferred draft alignment overhead line
- 2024 preferred draft alignment underground cable
- Substations



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Q16. Do you have any comments on the following within this section?

- Proposed overhead line alignment.
- Proposed pylon locations (if you would like to comment on specific pylon locations, please refer to the numbering in the Project maps / Project area maps, 2024 Design Development Report and the interactive Project map, which can be found here nationalgrid.com/norwich-to-tilbury).
- Proposed underground cable locations.
- Proposed CSE compound location.
- Work to connect the proposed new underground cables into the existing Tilbury Substation.
- Our proposals for construction, including access roads and tracks, compounds and associated requirements.

Q17. Do you have any further comments on our proposals in this section?

General considerations

Q18. Is there anything you would like us to consider as we finalise our proposals?

Our consultation

Please let us know your views on the quality of our printed and online consultation materials, our public information events and online webinars, how we have notified people about our proposals and anything else related to this consultation.

Q19. How did you hear about this consultation?

Please tick all that apply

- ☐ Received a letter or email from National Grid
- ☐ Received a letter or email from Fisher German
- ☐ Received information from a local authority
- ☐ Informed by a local councillor or parish/ town council
- ☐ Saw an advert in a local newspaper/ publication
- ☐ Saw coverage in local and/or national media
- ☐ Saw social media coverage/advertising
- ☐ Word of mouth
- ☐ Other (please state)

Q20. Please rate the information we have published in terms of how clearly it was presented and how easy it was to understand

- ☐ Very good
- ☐ Good
- ☐ Average
- ☐ Poor
- ☐ Very poor
- ☐ Unsure

Tell us more about why you selected the above option

Q21. If you attended one of our public information events, how did you find it?

- ☐ Very informative
- ☐ Quite informative
- ☐ Not informative
- ☐ No opinion

Q22. If you attended one of our online webinars, how did you find it?

- ☐ Very informative
- ☐ Quite informative
- ☐ Not informative
- ☐ No opinion

Q23. Do you have further comments about our materials, consultation process or any suggestions for how we can improve our consultation?

Q24. What is your gender?

- ☐ Male
- ☐ Female
- ☐ Non-binary
- ☐ Prefer not to say

Q25. Do you consider yourself a person with a disability?

- ☐ Yes
- ☐ No
- ☐ Prefer not to say

Q26. How would you describe your ethnic background?

- ☐ White English, Welsh, Scottish, Northern Irish or British
- ☐ Irish
- ☐ Gypsy or Irish Traveller
- ☐ Any other White background
- ☐ Mixed or Multiple ethnic groups
- ☐ White and Black Caribbean
- ☐ White and Black African
- ☐ White and Asian
- ☐ Any other Mixed or Multiple ethnic background (please state)

☐

- ☐ Asian or Asian British
- ☐ Indian
- ☐ Pakistani
- ☐ Bangladeshi
- ☐ Chinese
- ☐ Any other Asian background
- ☐ Black, African, Caribbean or Black British
- ☐ African
- ☐ Caribbean
- ☐ Any other Black, African or Caribbean background (please state)

☐

- ☐ Arab
- ☐ Any other ethnic group (please state)

☐

- ☐ Prefer not to say

Q27. What is your age?

- ☐ Under 16
- ☐ 16-24
- ☐ 25-34
- ☐ 35-44
- ☐ 45-54
- ☐ 55-64
- ☐ 65+
- ☐ Prefer not to say

Q28. Please provide any further comments you may have

Next steps

Your comments must be received by **11.59pm Tuesday 18 June 2024.**

To return this feedback questionnaire free of charge, please address your envelope to Freepost N TO T (no stamp or further address details are required).

We will take all the feedback we receive into consideration as we continue to develop our plans for the Project. We will summarise all feedback, and how we have considered it, in our Consultation Feedback Report which will form part of our DCO application.

Once the DCO application is submitted, the Planning Inspectorate on behalf of the Secretary of State, has up to 28 days to decide whether the application meets the standards required to be accepted for examination.

If the application is accepted, it will go through a six-month examination period. Careful consideration is given by the Examining Authority, including to all relevant and written representations, and supporting evidence.

The Examining Authority is the Inspector or the Panel of Inspectors appointed to conduct the Examination of the application for the DCO.

The Examining Authority must prepare a report on the application and submit this to the Secretary of State, including a recommendation, within three months of the close of Examination. The Secretary of State has a further three months to make a decision on whether to grant or refuse development consent.

Data privacy notice

National Grid is committed to protecting your personal information.

Whenever you provide such information, we are legally obliged to use it in line with all applicable laws concerning the protection of personal data, including the UK General Data Protection Regulation (GDPR).

How will National Grid use the information we collect about you?

We will use your personal data collected via this consultation for a number of purposes, including:

- to analyse your feedback to the consultation
- to produce a Consultation Feedback Report, based on our analysis of responses (individuals will not be identified in that report.)
- to write to you with updates about the results of the consultation and other developments if you have provided consent for us to do so
- to keep up-to-date records of our communications with individuals and organisations.

Any personal information you include in this questionnaire will be handled and used by (or made available to) the following recipients to record, analyse and report on the feedback we receive:

- National Grid
- the Planning Inspectorate (which will administer our application for consent to build the Project – any details published as part of this process will be anonymised)
- the Secretary of State (who will take the decision on our application)
- our legal advisers
- consultants working on the Project.

What rights do I have over my personal data? Under the terms of the UK GDPR you have certain rights over how your personal data is retained and used by National Grid. For more information, see our full data privacy statement: nationalgrid.com/privacy-policy.

Contact us

Email us:
contact@n-t.nationalgrid.com

Visit our website at:
nationalgrid.com/norwich-to-tilbury

Call our freephone
0800 915 2497
between 9am and 5:30pm

How to provide feedback

Post your written responses (no stamp required) to:
FREEPOST N TO T

Email us:
contact@n-t.nationalgrid.com

Complete the feedback questionnaire on our website
nationalgrid.com/norwich-to-tilbury

Landowners

If you are a landowner or have an interest in any of the land which interacts with our current proposals, you can contact the Norwich to Tilbury Land Team at Fisher German below, and you are also free to provide feedback on any aspect of the Project.

Freephone:
0808 175 3314

Email:
Norwich-Tilbury@fishergerman.co.uk

Post: Norwich to Tilbury Land Team, Fisher German, The Atrium, Risby Business Park, Newmarket Road, Risby, Bury St Edmunds, IP28 6RD

Notes



Contact us

If you would like to contact the community relations team, please get in touch via:

0800 915 2497
FREEPOST N TO T
contact@n-t.nationalgrid.com
nationalgrid.com/norwich-to-tilbury

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Appendix I15

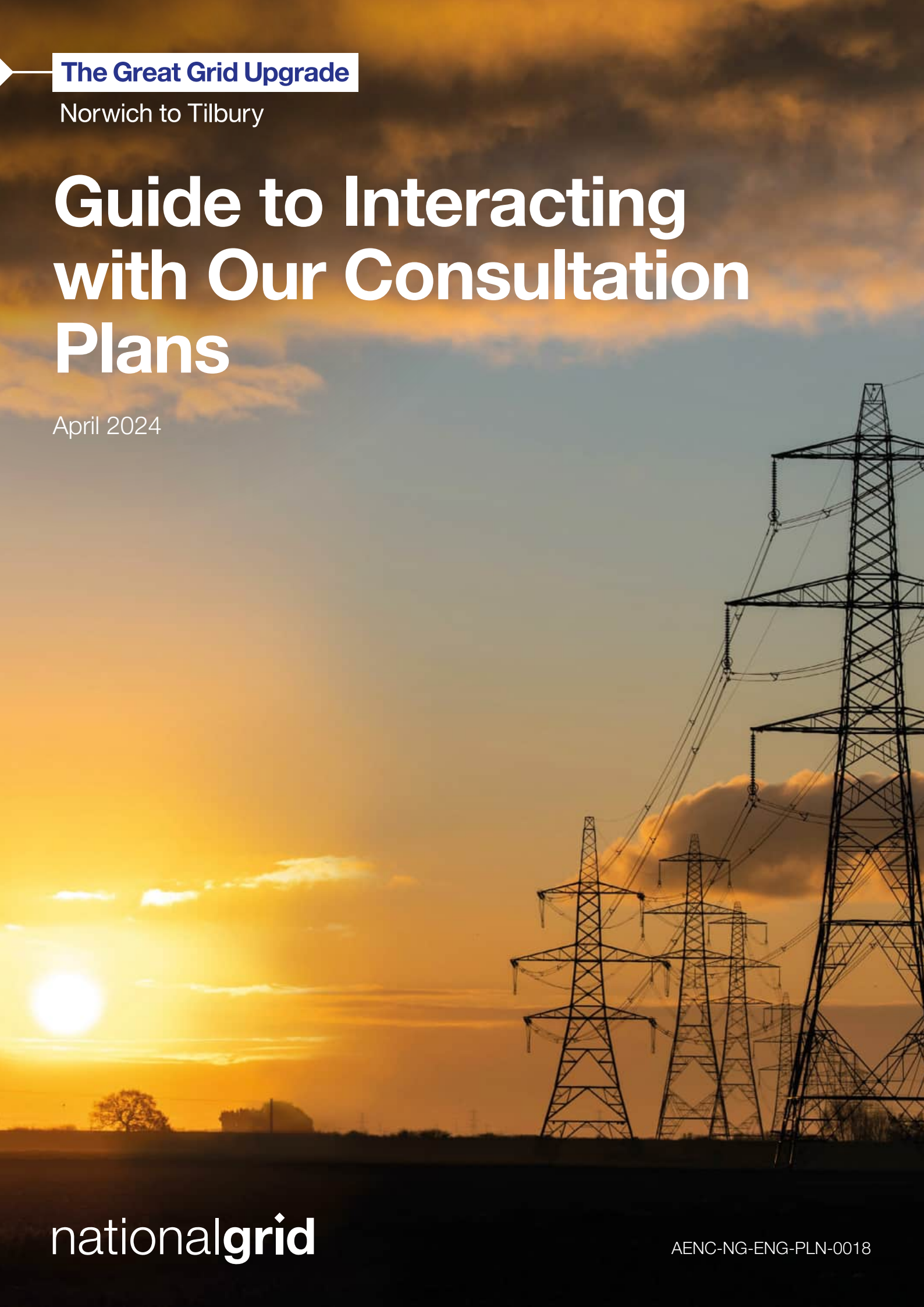
Guide to Interacting with our Consultation Plans

The Great Grid Upgrade

Norwich to Tilbury

Guide to Interacting with Our Consultation Plans

April 2024



nationalgrid

AENC-NG-ENG-PLN-0018

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1. Introduction

1.1.1 This document has been produced by National Grid Electricity Transmission plc (‘National Grid’) to provide guidance on interacting with our latest consultation plans during the statutory consultation on Norwich to Tilbury (hereafter referred to as the ‘Project’). Here we use the term “statutory consultation” to help distinguish this phase of Project engagement with previous phases of consultation. For the remainder of this document, we will for ease simply refer to “consultation”.

1.1.2 The consultation runs from 12.00 noon on 10 April 2024 and 11.59pm on Tuesday 18 June 2024.

1.1.3 To help to explain and visualise the emerging proposals for the Project, we have prepared a series of consultation plans. This guide provides more detail about the plans that are available and what is shown on each plan.

2. What are the consultation plans?

2.1.1 National Grid has prepared a series of plans to support the consultation, to help people understand the emerging proposals and how they may be affected. On request we would also consider providing materials in alternative formats.

2.1.2 Whilst the plans illustrate many aspects of the Project, they do not explain the rationale for the design. This can be found in the 2024 Design Development Report which has been published to accompany the consultation. The consultation documents also include the Preliminary Environmental Information Report (PEIR), which describes the likely significant environmental effect that could result from the Project.

2.1.3 In accordance with normal practice, it should be noted that all plans published in support of the consultation are based on typical and indicative designs. They have been produced to give respondents to the consultation a general understanding of the Project and to help inform feedback. The designs are likely to change in response to consultation feedback, ongoing design, surveys, and environmental assessment. The application for development consent will contain an updated design (and accompanying set of plans), although it should be noted that even at that stage flexibility will be retained through Limits of Deviation (LoD) [see Section 4.5].

3. List of plans for consultation

The standalone plans published to support our consultation are listed below[1]:

Table 3.1 – List of Plans

Title	Description
Overall Location Plan	Allows the user to locate the Project within its regional context. It shows the 2024 preferred draft alignment, Cable Sealing End (CSE) compounds and substation locations. Also shows local authority boundaries.
Consultation Plans Master Key Plan	Allows the user to locate the Project and shows the 2024 draft Order Limits. It shows Project section indexes to enable the user to navigate to the relevant specific plan set of interest to them. Also shows local authority boundaries.
Consultation Plans	These plans provide a detailed overview of the current proposals, divided over 89 sheets across eight sections at 1:2,500 scale. 1:2,500 scale has been used to provide the specific location of permanent assets and construction, operation, and maintenance areas, while also providing as much context of the surrounding area as possible. A key plan is also included for each section of the Project to help users quickly locate an area or sheet of interest along the length of the Project. The plans are ordered from north (existing Norwich Main Substation) to south (existing Tilbury Substation). The plans include the 2024 preferred draft alignment as currently envisaged (encompassing indicative locations for lattice pylons, overhead lines, underground cables centerline and construction swathe and CSE compounds), as well as the draft Order Limits. The plans show the indicative substation boundaries at the proposed East Anglia Connection Node (EACN) substation, the existing and proposed extensions at Norwich Main and Bramford Substations, as well as the existing Tilbury Substation.

[1] Figures, images, and plates provided in other consultation documentation are to be read within the context of the associated document.

Title	Description
	The plans also show the zone for permanent assets and zone for construction, operation, and maintenance.
Waveney Valley Alternative (WVA) Consultation Plan	An additional consultation plan showing the Waveney Valley Alternative, across two sheets at 1:2,500 scale. A key plan is also included at 1:7,500 scale. The Waveney Valley Alternative plan is a repeat of the Consultation Plan format as described above but showing the detail of the alternative design comprising of underground cables across the Waveney Valley with CSE compounds either side to enable the transition of overhead line to underground cable and back again. The plan provides the specific location of permanent assets and construction, operation, and maintenance areas, while also providing as much context of the surrounding area as possible.
Construction Access Master Key Plan	Allows the user to locate the Project and shows the proposed access routes for construction, referred to as Primary Access Routes. It shows Project section indexes to enable the user to navigate to the relevant specific plan set of interest to them, alongside displaying the local authority boundaries.
Construction Access Plans	These plans provide specific focus on the proposed routeing of construction traffic to access the construction areas, and include indicative areas of works required to the public highway to facilitate the construction of the Project including the indicative Highway Mitigation Draft Order Limits and areas where traffic management measures may be required. These plans comprise a total of 60 sheets at either 1:2500 or 1:5000 scale dependant on access route length. These plans do not show the draft Order Limits, these can be viewed on the Consultation Plans. A key plan is also included for each section of the Project to help users quickly locate an area or sheet of interest along the length of the Project.
Environmental Constraints Plans	These plans provide the specific location of permanent assets as per the Consultation Plans, divided over 89 sheets across eight sections at 1:2,500 scale. Key Plans are also included for each Project Section at various scales. The plans show the current permanent asset proposals and draft Order Limits for the Project and some

Title	Description
	environmental, third party and National Grid constraints within proximity of the 2024 preferred draft alignment. The constraints shown include: • Listed buildings; • Scheduled Monuments; • Conservation Areas; • Registered Park and Gardens; • Countryside and Rights of Way (CRoW) – conclusive registered common land/access land; • National Landscapes (previously AONBs); • Special Areas of Conservation (SAC); • Sites of Special Scientific Interest (SSSI); • Proposed Thames Estuary SSSI notification project; • County Wildlife Sites (cover Norfolk and Suffolk) Local Wildlife Sites (cover Essex) (both designations have the same level of protection); • Ancient Woodland; • Flood Zone 3; • National Gas pipelines and sites; • Existing 400 kV overhead lines; and • Existing 132 kV overhead lines.
Waveney Valley Alternative (WVA) Environmental Constraints Plan	An additional Environmental Constraints plan showing the Waveney Valley Alternative, across two sheets at 1:2,500 scale. The Waveney Valley Alternative Environmental Constraints plan is a repeat of the Environmental Constraints plan format as described above but showing the detail of the alternative design comprising of underground cables across the Waveney Valley with CSE compounds either side to enable the transition of overhead line to underground cable and back again. The plan provides the specific location of permanent assets and construction, operation, and maintenance areas, while also providing as much context of the surrounding area and constraints as possible.

Title	Description
Site Layout Drawings	The site layout drawings provide a more detailed look at the Project substations and CSE compounds. These plans indicate the location of the permanent CSE compounds, existing substations and extensions, and the proposed EACN substation and the works that are anticipated in the vicinity of each site to support construction and ongoing operation. This includes: • Temporary access routes (for construction); • Permanent access routes (for ongoing operation and maintenance); • Construction compounds for storage of plant and materials, and siting welfare areas during the construction phase; • Drainage areas (including attenuation or infiltration ponds and outfalls to watercourses, where required) – these are shown for temporary and permanent works; and • Permanent earthworks bunds (these are included to indicate that there will be permanent landscaping with material arising from site – the shape and location of bunds has not yet had landscaping design input). The drawings also show the draft Order Limits, within which the above features may move to accommodate changes as the design and understanding of the site develops.

4. What do the plans show?

4.1 Project Sections

4.1.1 The Project has been subdivided into eight sections which largely align to local authority boundaries. Within each section there is an overhead line route with its route specific pylon numbering sequence (RG, JC, and TB) as set out below. Every overhead line route in the country has a unique identifying numbering sequence for ease of reference. As the Project currently has three individual transmission routes[2] there is a sequence for each so that these can be referenced by the public when providing feedback:

- Section A – South Norfolk Council (RG);
- Section WVA – South Norfolk Council and Mid Suffolk District Council (RG WVA);
- Section B – Mid Suffolk District Council (RG and JC);
- Section C – Babergh District Council and Tendring District Council (JC and TB);
- Section D – Colchester City Council (TB);
- Section E – Braintree District Council (TB);
- Section F – Chelmsford City Council (TB);
- Section G – Basildon Borough Council and Brentwood Borough Council (TB); and
- Section H – Thurrock Council (TB).

4.1.2 An additional “Section J” is included on the Construction Access Plans to reflect the incorporation of a Primary Access Route from the A11 near Thetford that is necessary for the construction of the Waveney Valley Alternative.

4.1.3 Figure 4.1 and Figure 4.2 below highlight the breakdown of the Project sections.

[2] Pylon and gantry numbering is sequential from north to south with a two letter prefix. The prefix is RG for the section from Norwich to Bramford, JC from Bramford to the EACN substation and TB from the EACN substation to Tilbury.

Figure 4.1 – Master Key Plan: Project Sections

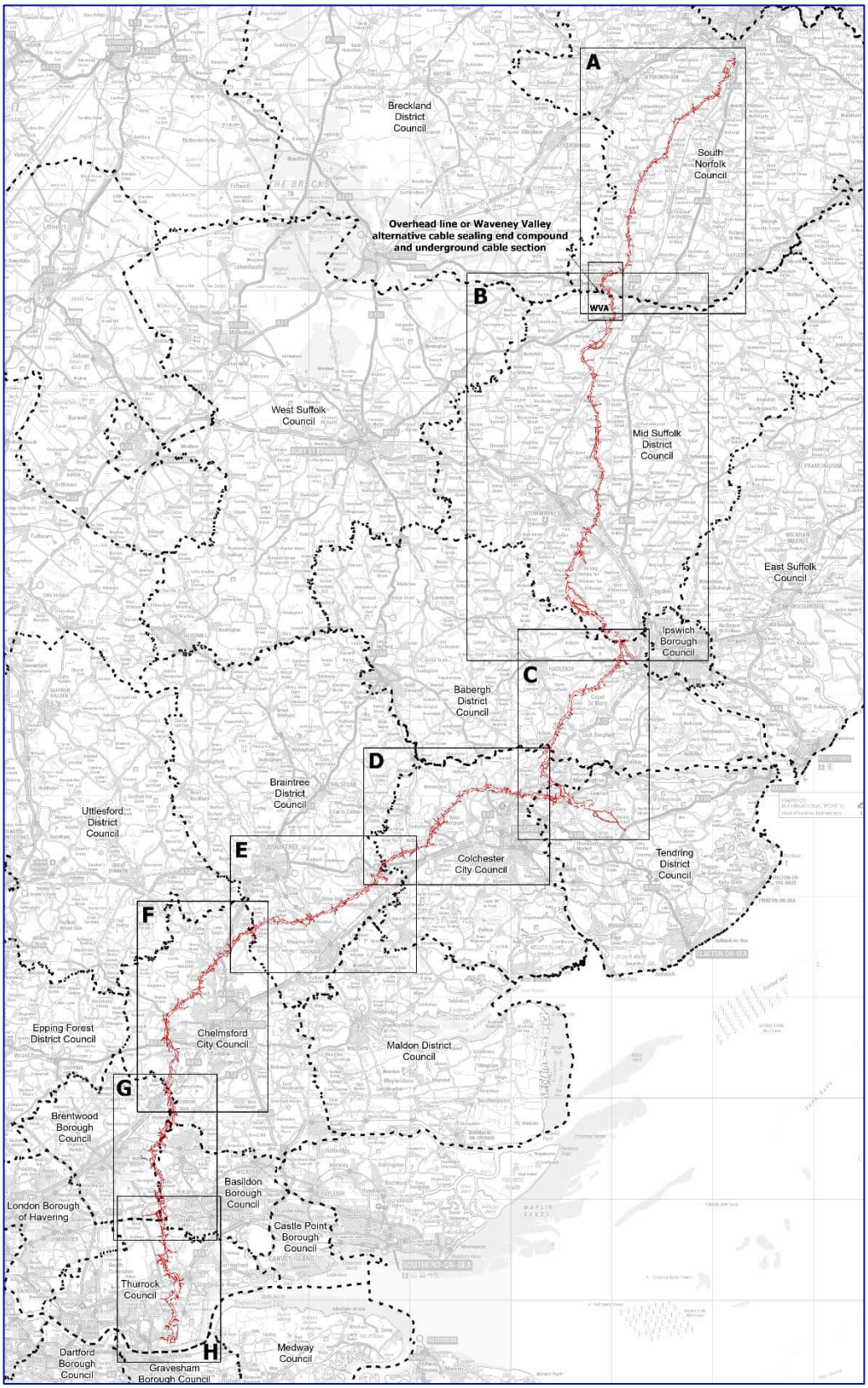
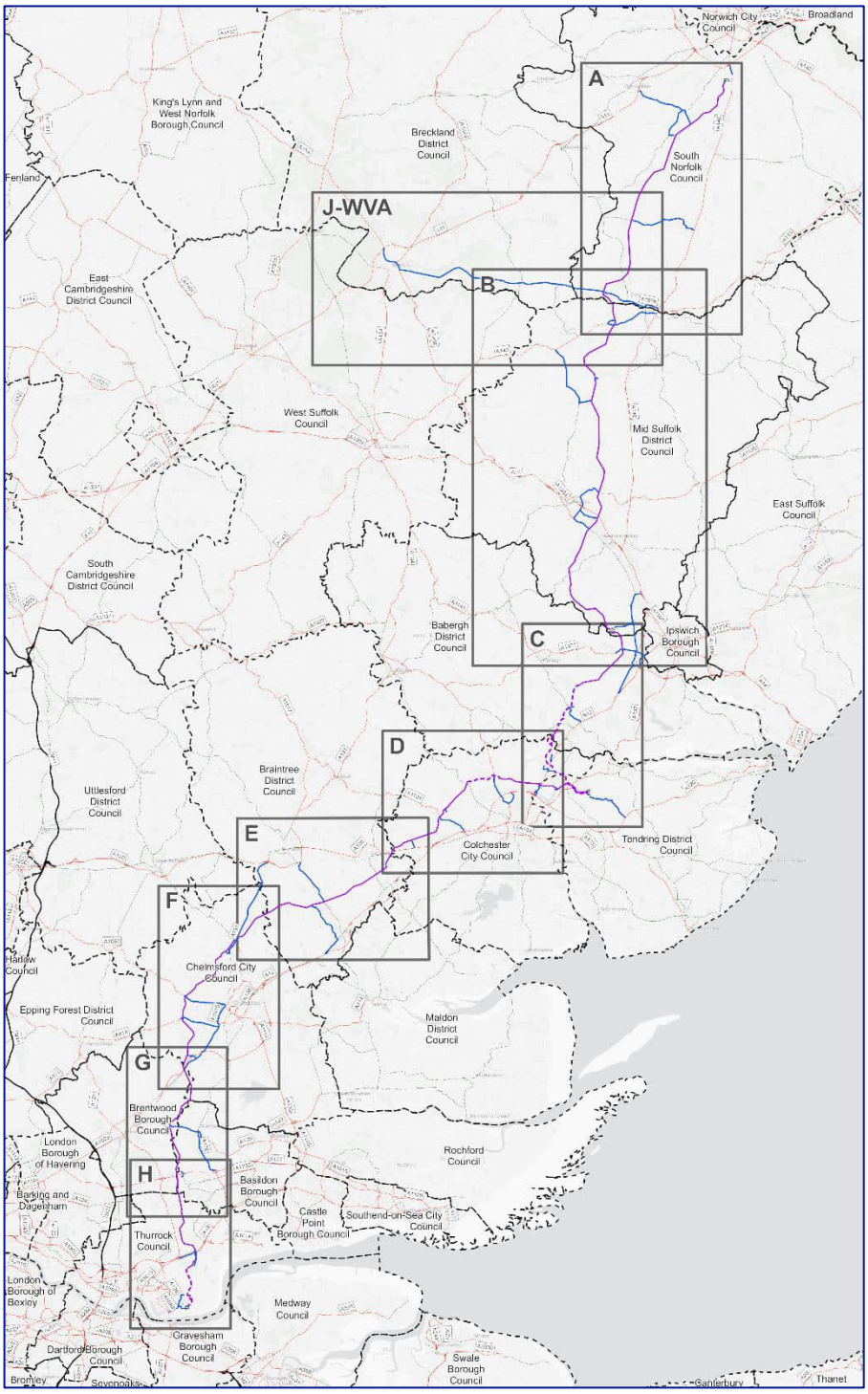


Figure 4.2 – Construction Access Plan Master Key Plan: Project Sections



4.2 The 2024 preferred draft alignment

4.2.1 Certain consultation plans use the term 2024 preferred draft alignment when describing the route.

4.2.2 The 2024 preferred draft alignment is a concept used to help communicate the potential route of the Project and has been developed as a result of feedback obtained during the 2022 and 2023 non-statutory consultations, ongoing engineering design and environmental assessment work to date. It encompasses indicative locations for lattice pylons, overhead lines, underground cables, CSE compounds and the EACN substation and the works at the existing substations at Norwich, Bramford and Tilbury.

4.2.3 The 2024 preferred draft alignment shown on these consultation plans is subject to change following consideration of consultation feedback and ongoing design development.

4.2.4 Moving forwards, National Grid will not be seeking approval, through the development consent order process, for a specific alignment (including fixed pylon locations). Approval will instead be sought to construct and operate the Project within parameters, known as LoD [See Section 4.5].

4.3 2024 preferred draft alignment underground cables

4.3.1 Further to the 2023 non-statutory consultation, which only showed an indicative line for the proposed route of the underground cables, the 2024 preferred draft underground cable alignment shows the construction swathe for the proposed underground cables.

4.3.2 There are two sections of underground cable shown on our plans where the underground cable is shown to ‘split’ and follow two corridors, these sections are within the Dedham Vale National Landscape (an AONB) and at Tilbury, further details provided below. All split sections shown are proposed to have underground cables installed, not in one or the other.

Dedham Vale National Landscape (an AONB)

4.3.3 As the proposed underground cable route passes through the Dedham Vale National Landscape (an AONB), it must cross the River Stour at a proposed location to the west of Stratford St Mary. At this location there are existing constraints in the form of a Source Protection Zone, an existing high-pressure gas pipeline and various ponds in between the two corridors. The 2024 preferred draft alignment has therefore been ‘split’ for the potential to utilise two corridors to avoid these constraints.

Tilbury

4.3.4 The proposed underground cable route must cross the existing railway line to the north of Tilbury Substation near to Cooper Shaw Road. Due to the presence of existing overhead line pylons, it has not been possible to identify one corridor wide enough for the required trenchless installation. The 2024 preferred draft alignment has therefore been ‘split’ either side of existing overhead line pylons to enable the crossing of the railway line.

4.4 Draft Order Limits

4.4.1 The maximum extent of land within which the Project, may be carried out, and includes both permanent and temporary land required to build and operate the Project.

4.5 Limits of Deviation

4.5.1 LoD represent the maximum deviation for permanent infrastructure. The LoD allow for the adjustment to the final positioning of the Project features to avoid localised constraints or unknown or unforeseeable issues that may arise.

4.5.2 Site specific LoD increases noted in Section 7.2.

5. Key Features

The key features shown on the various plans for consultation are summarised in the following tables:

Table 5.1 – Overall Location Plan Key Features

Key Features	Overview
2024 preferred draft alignment	This term is used to help communicate the potential alignment of the Project within the plans. It is the design as shown on the Consultation Plans, which has been developed through an iterative design process including engineering and environmental inputs alongside feedback received through consultation.
Overhead lines	Conductors (wires) carrying electric current, strung from pylon to pylon.
CSE compounds	Compounds containing equipment needed to transfer transmission circuits between underground cables and overhead lines.
Underground cabling	Insulated conductors carrying electric current designed for underground installation.
Existing and proposed substations	Project substations. Where existing, extended, or new substations are located. Substations are used to control the flow of power through the electricity system. They are also used to change (or transform) the voltage from a higher to lower voltage to allow it to be transmitted to local homes and businesses

Table 5.2 – Consultation Master Key Plan Key Features

Key Features	Overview
Draft order limits	Red line boundary extents of the Project.

Table 5.3 – Consultation Plans (including the Waveney Valley Alternative Consultation Plan) Key Features

Key Features	Overview
Draft order limits	Red line boundary extents of the Project.
Zone for permanent assets	Shows the areas of the draft Order Limits that may contain new permanent infrastructure (i.e. pylons, conductors, underground cables, CSE compounds, substations, permanent accesses, and environmental mitigation. For the National Grid works only (not third-party statutory undertaker's works).
Zone for construction, operation, and maintenance	Shows the areas of the draft Order Limits that are required for the construction, operation, and maintenance of the Project. This reflects National Grid and Statutory Undertaker works.
Statutory undertaker works	Indicative work areas required to divert, underground or protect existing third-party statutory undertaker assets, in order to facilitate the Project. e.g. communications and electricity wood pole overhead lines, electricity lattice pylon overhead lines and buried pipelines (gas, oil, sewage, and water etc).
Environmental Areas	Preliminary areas identified for environmental mitigation and/or Biodiversity Net Gain (BNG). Generally located at substations and cable sealing end compounds. As further baseline data is collected, and discussions take place with consultees and landowners, the Environmental Areas will be refined.
2024 preferred draft alignment	This term is used to help communicate the potential alignment of the Project within the plans. It is the design as shown on the Consultation Plans, which has been developed through an iterative design process including engineering and environmental inputs alongside feedback received through consultation.
Overhead lines	Conductors (wires) carrying electric current, strung from pylon to pylon.
Pylons	Structures that support the overhead line (conductors). There are two types of lattice pylons; suspension, where the conductors are simply suspended from the pylon and

Key Features	Overview
	tension (angle), where the overhead line changes direction.
Gantries	An overhead bridge-like structure supporting electrical equipment (these are lower height structures - typically up to 15 m in height). A transition point from overhead line equipment to equipment in a substation or cable sealing end compound.
Full Line Tension Gantries	A slightly larger gantry structure (these are lower height structures - typically up to 15 m in height) for supporting full line tension loading. A transition point from overhead line equipment to equipment in a substation or cable sealing end compound. A full line tension gantry however allows a longer span from the last pylon to the CSE compound / substation.
CSE compounds	Compounds containing equipment needed to transfer transmission circuits between underground cables and overhead lines.
Underground cable	Insulated conductors carrying electric current designed for underground installation.
Underground cable swathe centreline	The indicative centreline for the underground cable construction swathe.
Underground cable construction swathe	Typically, a 120 m wide swathe to allow for installation of the cable, through standard opencut methods. The construction swathe widens where trenchless methods are anticipated.
Underground cable trenchless crossing	Locations where the underground cable installation method is proposed as trenchless (or potentially so) e.g. under main rivers and railways.
Substation boundary	Proposed substation boundaries. Where existing, extended, or new substations are positioned. Includes the existing substation boundaries at Norwich Main (including extension), Bramford (including extension) and Tilbury substations. Also, the proposed EACN substation.
Permanent access route	Permanent operation and maintenance access – physical access road to cable sealing end compounds and substations.

Key Features	Overview
Existing DNO alignments (to be modified/dismantled)	Shows specific Distribution Network Operator (DNO) lattice pylon alignments and pylon positions to be dismantled/modified.
Haul roads	Temporary roads provided outside of the existing Public Highway. These routes will be managed by National Grid and link the site access points to the working areas. For access to construction works on overhead lines, underground cables, CSE compounds and substations.
Site access points (bellmouths)	The location on a Primary Access Route where construction vehicles will transition between the local road network (LRN) and haul roads/working areas.
Crossover points	Locations where haul roads cross the LRN but are not generally proposed for construction HGVs to transition to or from the LRN.
Visibility splays	An area proposed to be kept clear of visual obstructions that would impact the ability to see approaching traffic at a junction.
Crossing protection work area	Work area required to install scaffolding – required to provide a netted protection of crossings when installing the conductors (e.g. public highways and railways crossings).
Construction compound	The type, size and what is included at each compound is subject to the works it is facilitating but may include for example: the working yard / storage area, parking, offices, reception, break out areas, toilets/showers/changing facilities, kitchen/canteen, visitors centre, induction/training room and drying room.
Construction laydown area	Areas identified for general construction activities (e.g. for temporary holding of materials).

Table 5.4 – Construction Access Master Key Plan Key Features

Key Features	Overview
2024 preferred draft alignment	This term is used to help communicate the potential alignment of the Project within the plans. It is the design as shown on the Consultation Plans, which has been developed through an iterative design process including engineering and environmental inputs alongside feedback received through consultation.

Key Features	Overview
Overhead lines	Conductors (wires) carrying electric current, strung from pylon to pylon.
Underground cable swathe centreline	The indicative centreline for the underground cable construction swathe.
Primary Access Route	An access route designated for use by construction vehicles along the public highway (typically for Heavy Goods Vehicles (HGVs) to travel from the Strategic Road Network to a Site Access Point
A Road	Major roads intended to provide large-scale transport links within or between areas, defined by the Department for Transport
B Road	Roads intended to connect different areas, and to feed traffic between A roads and smaller roads on the network, defined by the Department for Transport

Table 5.5 – Construction Access Plans Key Features

Key Features	Overview
Highway mitigation	A ranked scale for the level of mitigation works anticipated to be required to the public highway to facilitate construction traffic access for the Project.
Indicative highways mitigation draft order limits	A red line boundary denoting the anticipated extent of land required for highway works relating to the project, where works are anticipated to be extend beyond the public highway boundary.
2024 preferred draft alignment	This term is used to help communicate the potential alignment of the Project within the plans. It is the design as shown on the Consultation Plans, which has been developed through an iterative design process including engineering and environmental inputs alongside feedback received through consultation.
Overhead lines	Conductors (wires) carrying electric current, strung from pylon to pylon.
Underground cable swathe centreline	The indicative centreline for the underground cable construction swathe.
Site Access Point	The location on a Primary Access Route where construction vehicles will transition between the LRN and haul roads/working areas.

Key Features	Overview
Sheet Match Line	The Construction Access plans use an alternative approach to convey the relationship between preceding and succeeding plans along the alignment of the proposed construction access routes. Instead of using a black continuation line, a “Match Line” symbol is used.

Table 5.6 – Constraint Plans Key Features

Key Features	Overview
2024 preferred draft alignment	This term is used to help communicate the potential alignment of the Project within the plans. It is the design as shown on the Consultation Plans, which has been developed through an iterative design process including engineering and environmental inputs alongside feedback received through consultation.
Overhead lines	Conductors (wires) carrying electric current, strung from pylon to pylon.
Pylons	Structures that support the overhead line (conductors). There are two types of lattice pylons; suspension, where the conductors are simply suspended from the tower and tension (angle), where the overhead line changes direction.
Gantries	An overhead bridge-like structure supporting electrical equipment (these are lower height structures - typically up to 15 m in height). A transition point from overhead line equipment to equipment in a substation or CSE compound.
Full Line Tension Gantries	A slightly larger gantry structure (these are lower height structures - typically up to 15 m in height) for supporting full line tension loading. A transition point from overhead line equipment to equipment in a substation or cable sealing end compound. A full line tension gantry however allows a longer span from the last pylon to the CSE compound / substation.
CSE compound	Compounds containing equipment needed to transfer transmission circuits between underground cables and overhead lines.
Underground cable	Insulated conductors carrying electric current designed for underground installation.

Key Features	Overview
Underground cable swathe centreline	The indicative centreline for the underground cable construction swathe.
Underground cable construction swathe	Typically, a 120 m wide swathe to allow for installation of the cable, through standard opencut methods. The construction swathe widens where trenchless methods are anticipated.
Substation boundary	Proposed substation boundaries. Where existing, extended, or new substations are positioned. Includes the existing substation boundaries (including extensions where relevant) at Norwich Main, Bramford and Tilbury substations. Also, the proposed EACN Substation.
Environmental Constraints	See plan legend in Table 6.77 – Constraint Plan Legend Symbology

Table 5.7 – Site Layout Drawings Key Features

Key Features	Overview
Draft order limits	Red line boundary extents of the Project.
Underground cable construction swathe	Typically, a 120 m wide swathe to allow for installation of the cable, through standard opencut methods. The construction swathe widens where trenchless methods are anticipated. This swathe includes the underground cable construction haul road.
Underground cable swathe centreline	The indicative centreline for the underground cable construction swathe.
CSE compound boundary	Extent of proposed CSE compounds. CSE compounds contain equipment needed to transfer transmission circuits between underground cables and overhead lines.
Existing substation boundary	Norwich Main Substation: Extent of existing substation (limited works)
At Bramford Substation, legend includes the supplementary text "(to contain proposed project works)"	Bramford Substation: Area containing existing substation and a previously levelled hardstanding area adjacent to the existing substation.

Key Features	Overview
Proposed substation extension boundary	Norwich Main Substation: Extent of new substation works (proposed as part of a separate project)
At Bramford Substation, legend includes the supplementary text "(to contain proposed project works)"	Bramford Substation: Extension to existing levelled hardstanding area adjacent to the existing substation.
Proposed substation boundary	Extent of proposed EACN substation
Substation boundary	Specific to Tilbury Substation: Extent of existing substation. Note that proposed works to the substation will remain within the existing boundary.
Temporary construction compound	The type, size and what is included at each compound is subject to the works it is facilitating but may include for example: the working yard / storage area, parking, offices, reception, break out areas, toilets/showers/changing facilities, kitchen/canteen, visitors centre, induction/training room and drying room.
Temporary construction compound (additional)	Specific to the EACN substation: An additional area allocated for storage of plant/materials and other activities to support construction. This additional compound area recognises the significant amount of activity (overhead line, underground cable and substation works) that will be required at the location of the EACN substation.
Approximate fill/cut earthworks extents	The approximate extent of slopes required to achieve a level CSE compound / substation site within the existing topography.
Permanent spoil bund	Areas to indicate the requirement for landscaping using excavated material arising from site. The shape and location of bunds has not yet had landscaping design input.
Permanent CSE compound / substation access route	Access road to CSE compound / substation for ongoing operation and maintenance requirements.
Temporary CSE compound / substation haul road	Temporary access haul road to CSE compound / substation for construction works.

Key Features	Overview
Temporary overhead line haul road	Temporary access haul road to reach overhead line works, where access is required via CSE compound / substation locations.
Permanent surface water attenuation drainage pond	Ponds for storage of surface water runoff from the CSE compound / substation and permanent access roads in order to control rate of discharge to watercourses (or to allow infiltration back into the ground if conditions are suitable).
Temporary surface water attenuation/infiltration drainage pond	Ponds for storage of surface water runoff from the temporary construction compound and temporary access roads in order to control rate of discharge to watercourses (or to allow infiltration back into the ground if conditions are suitable).
Permanent/temporary drainage outfall alignment	Indicative route for drainage of surface water to/from attenuation ponds.
Outfall location	Location for discharge of surface water runoff to a watercourse (at agreed rates).
Manhole location	Potential location for maintenance access to drainage outfall alignment.
New overhead lines	Conductors (wires) carrying electric current, strung from pylon to pylon.
Overhead line pylon construction area	Working area for construction of pylons.
Existing pylons to be retained	Pylons, which are to be retained, that are in close proximity to the underground cable alignment or otherwise in the vicinity of the substation. These features are only shown on the Tilbury Substation drawing because they have particularly influenced the layout in this area.

6. Symbology

6.1.1 The key features shown on the Legend of the various plans for consultation are illustrated in the following table. Note the features shown within the Legend are applicable to any relevant key features of the whole section rather than the individual sheets (i.e. the whole of Section A, not a specific sheet within Section A). Additionally, each table depicts the legend of the whole plan set, i.e. all section consultation plans, rather than each individual section.

Table 6.1 – Overall Location Plan Legend Symbology

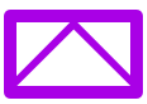
Key Features	Legend Entry	Symbol
	Local authority boundary[3]	
Proposed project design details	New overhead line	
	New underground cable	
	Substation existing & new	
	New cable sealing end compound	

Table 6.2 – Consultation Master Key Plan Legend Symbology

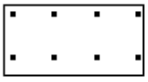
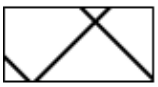
Key Features	Legend Entry	Symbol
	Local authority boundary[3]	
	Section index	
Proposed project design details	Draft order limits	

[3] Local authority boundaries shown exclude counties.

Table 6.3 – Consultation Plans (including Waveney Valley Alternative Consultation Plan) Legend Symbology

Key Features	Legend Entry	Symbol
	Local authority boundary[4]	
	Section boundary & local authority boundary	
	Section boundary	
	Sheet index cutlines	
	Sheet index	
Proposed land use	Draft order limits	
	Zone for permanent assets (NGET)	
	Zone for construction, operation, and maintenance (NGET and statutory undertaker)	
	Statutory undertaker works	
	Environmental areas	
Proposed project design details	New lattice pylon	
	New gantry	
	New full line tension gantry	
	New overhead line	

[4] Local authority boundaries shown exclude counties.

Key Features	Legend Entry	Symbol
	New underground cable swathe centreline	
	New underground cable construction swathe	
	New underground cable trenchless crossing	
	Existing substation boundary	
	Proposed substation extension boundary / Proposed EACN substation boundary	
	Cable sealing end compound boundary	
	Permanent access route including visibility splays (substations and cable sealing end compound)	
	Existing DNO lattice pylon – to be dismantled[5]	
	Existing DNO lattice pylon – to be modified	
	Existing DNO overhead line – to be dismantled	
	Existing DNO overhead line – to be modified	
Temporary works	Site access, crossover points and visibility splays	
	Haul roads	
	Haul roads for underground cable, cable sealing end compounds and substation works	

[5] Where known DNO lattice pylon numbers are provided on the consultation plans.

Key Features	Legend Entry	Symbol
	Crossing protection work area	
	Construction compound	
	Construction laydown area	

Table 6.4 – Construction Access Master Key Plan Legend Symbology

Key Features	Legend Entry	Symbol
	Section index	
	Local authority boundary[6]	
Existing roads	A road	
	B road	
	Motorway	
Proposed project design details	Existing / proposed extension or proposed new substation boundary	
	New overhead line	
	New underground cable swathe	
	Primary access route (no works anticipated)	

Table 6.55 – Construction Access Key Plan Legend Symbology

Key Features	Legend Entry	Symbol
	Sheet Index	

[6] Local authority boundaries shown exclude counties.

Key Features	Legend Entry	Symbol
	Local authority boundary[7]	
	Section boundary and local authority boundary	
	Section boundary	
Existing roads	A road	
	B road	
Proposed project design details	Existing / proposed extension or proposed new substation boundary	
	New overhead line	
	New underground cable swathe	
	Primary access route (no works anticipated)	

Table 6.66 – Construction Access Plan Legend Symbology

Key Features	Legend Entry	Symbol
	Sheet match line	Match Line
Existing land boundary	Local authority boundary[7]	
Proposed land use	Indicative highway mitigation draft order limits	
Proposed project design details	Existing, proposed extension or proposed new substation boundary	
	Primary access route (no works anticipated)	
	Proposed new private access road	
	New underground cable swathe centreline	

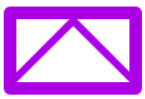
[7] Local authority boundaries shown exclude counties.

Key Features	Legend Entry	Symbol
	New overhead line	
	New lattice pylon	
Temporary works	Vegetation removal / cutting back / temporary traffic regulation orders	
	Modifications to existing highway features	
	Work within the existing highway boundary	
	Work outside the existing highway boundary. Based upon assumption of highway boundary extents	
	Site access point (bellmouth)	

Table 6.77 – Constraint Plan Legend Symbology

Key Features	Legend Entry	Symbol
	Local authority boundary[8]	
	Section boundary & local authority boundary	
	Section boundary	
	Sheet index cutlines	
	Sheet index	
	Draft order limits	

[8] Local authority boundaries shown exclude counties.

Key Features	Legend Entry	Symbol
	New lattice pylon	
	New gantry	
	New full line tension gantry	
	New overhead line	
	New underground cable swathe centreline	
	New underground cable construction swathe	
	Cable sealing end compound outline	
	Existing substation boundary	
	Proposed substation extension boundary/ Proposed EACN substation boundary	
	Grade I listed building	
	Grade II listed building	
	Grade II* listed building	
	Scheduled Monument (with accompanying list entry number)	
	Conservation areas	
	Registered parks and gardens	

Key Features	Legend Entry	Symbol
	Countryside and Rights of Way Open Access Land	
	National Landscapes (an AONB)	
	Special Areas of Conservation	
	Sites of Special Scientific Interest (including Thames Estuary Site of Special Scientific Interest notification project)	
	Ancient woodland	
	County / local wildlife sites	
	Flood zone 3	
	National Grid 275/400kV overhead line	
	UKPN 132kV overhead line	
	National Grid underground cable	
	National Grid Gas Pipeline	
	National Grid Gas Site	

Table 6.88 – Site Layout Drawings Legend Symbology

Key Features	Legend Entry	Symbol
	Draft order limits	
	Underground cable construction swathe (including cable construction haul road)	
	Underground cable swathe centreline	

Key Features	Legend Entry	Symbol
	Existing substation boundary *At Bramford Substation, legend includes the supplementary text "(to contain proposed project works)"*	
	Proposed substation/substation extension boundary *At Bramford Substation, legend includes the supplementary text "(to contain proposed project works)"*	
	Substation boundary	
	Cable sealing end compound boundary	
	Temporary construction compound	
	Temporary construction compound (additional if required)	
	Approximate exclusion zone for existing overhead lines	
	Approximate fill earthworks extents	
	Approximate cut earthworks extents	
	Permanent spoil bund[9]	
	Permanent cable sealing end compound access route	
	Temporary cable sealing end compound haul road	
	Temporary overhead line haul road	

[9] Spoil bunds are represented to demonstrate the requirement for permanent bunding of soil arising from the site area. These are still to be designed and are subject to further assessment. These will be integrated into the bio-diversity net gain and landscaping design.

Key Features	Legend Entry	Symbol
	Permanent surface water attenuation drainage pond	
	Temporary surface water attenuation drainage pond	
	Temporary surface water infiltration pond	
	Permanent drainage outfall alignment	
	Temporary drainage outfall alignment	
	Outfall location	
	Manhole location	
	New overhead line	
	Overhead line pylon construction area	
	Existing pylons to be retained	

7. Plan Specific Commentary

7.1 Introduction

7.1.1 This section describes any specific nuances or site-specific commentary for each consultation plan that may aide the viewer when reviewing the plans.

7.2 Consultation Plans

7.2.1 The Consultation Plans focus on each of the Project sections in detail, showing the draft Order Limits and intended works at a more local scale.

7.2.2 In six locations the draft Order Limits/ LoD have been expanded to encompass worst case scenarios for locations not yet fixed at statutory consultation:

- Exiting Norwich Main (Section A – Sheet 1), the overhead line as a part of the 2024 preferred draft alignment routes around the west of Sprow's Pit copse (RG001 to RG007). The draft Order Limits in this location have been widened to the east to allow flexibility to change the 2024 preferred draft alignment should planning consent not be granted for a battery storage facility to the south of the substation.
- River Stour (Section C – Sheet 8), assumes a worst-case that two trenchless crossing locations of the River Stour are required. Further environmental baseline data, ground investigations and engagement with stakeholders are ongoing. Subject to this additional work, it may be determined that a single crossing within the Source Protection Zone 1 would be taken forward.
- East of the A12 (Section C – Sheet 16), the draft Order Limits have been widened at between TB020 and TB021 as there are a number of planning applications associated with the Flying Trade Group and Crown Quarry Developments adjacent to the A12 between TB020 and TB021. The widened order limits are to allow flexibility for an alternative alignment should the distribution warehouses be consented.
- West of Kelvedon (Section E – Sheet 3), the 2024 preferred draft alignment was straightened out between TB081 and TB086. The draft order limits have been widened in this location to allow flexibility to change the 2024 preferred draft alignment to reduce impacts on a potential mineral extraction site should it be identified as being an allocated site in a future mineral plan.
- South of Rivenhall (Section E – Sheet 4), the draft Order Limits have been widened at TB091 to TB094. This has been included to allow flexibility to amend the 2024 preferred draft alignment which currently avoids proposed solar farm development. Should the proposed solar farm not be granted planning consent there is flexibility for the alignment to be amended.
- South of the A13 (Section H – Sheet 4), between TB254 and TB260 that reduces effects on the proposed Southfields development. The draft Order Limits have been widened between TB254 and TB260 to allow flexibility if the housing development does not go ahead, as the alignment could then move to the west, removing two

crossings of Buckingham Hill Road, a crossing of a historic landfill site and pylons situated within parkland and a quarry site.

7.2.3 We are seeking feedback on five additional haul road options which would provide flexibility for the Project should the existence of constraints or third-party developments require it:

- Thorpes Hill (Section C – Sheet 3), alternative access off Thorpes Hill in case haul road over Belstead Brook and through sensitive environment site is not feasible, to access JC016 onwards.
- EACN substation eastern access (Section C – Sheets 13 & 14), currently two proposed access into the new proposed EACN substation, with a northern route utilising more of the existing road network providing construction and operational and maintenance access, and a southern route sharing customer connections access for construction works if this route is available.
- Faulkbourne (Section E – Sheet 5), portion of the haul road between TB098 to TB101 shows two haul roads due to the constraint of the River Brain, and whether an existing ford crossing is feasible or if there is a requirement to construct a new bridge closer to the alignment of the new overhead line.
- Chelmsford Bypass (Section F – Sheet 2), additional haul road spur to return the haul road to the public highway on Braintree Road if the third-party highways development does go ahead, which would sever the currently proposed haul road running along the route of the new overhead line.
- Dunton Hills Garden Village (DHGV) [Section G/H – Sheet 6], additional haul road spur coming off Tilbury Road going via the third-party housing development (site specific details unknown so haul road provided as a placeholder only, siting subject ongoing consultation with the developer).
- Housing Development, East of DHGV (Section G – Sheet 7), currently showing two haul road options, one coming off Dunton Road and another off Lower Dunton Road which would adopt the road as a part of the third-party housing development (site specific details unknown so haul road provided as a placeholder only, siting subject ongoing consultation with the developer).

7.2.4 In addition, in various locations along the project, the draft Order Limits have been reduced due to known constraints flagged during engineering and environmental assessments. Below highlights several examples:

- Ancient woodlands (Figure 7.1 and Figure 7.2);
- Watercourse crossings (Figure 7.3); and
- Private gardens (Figure 7.4 and Figure 7.5).

Figure 7.1 – Reduction of draft Order Limits by proposed pylon RG171 due to proximity of an ancient woodland.

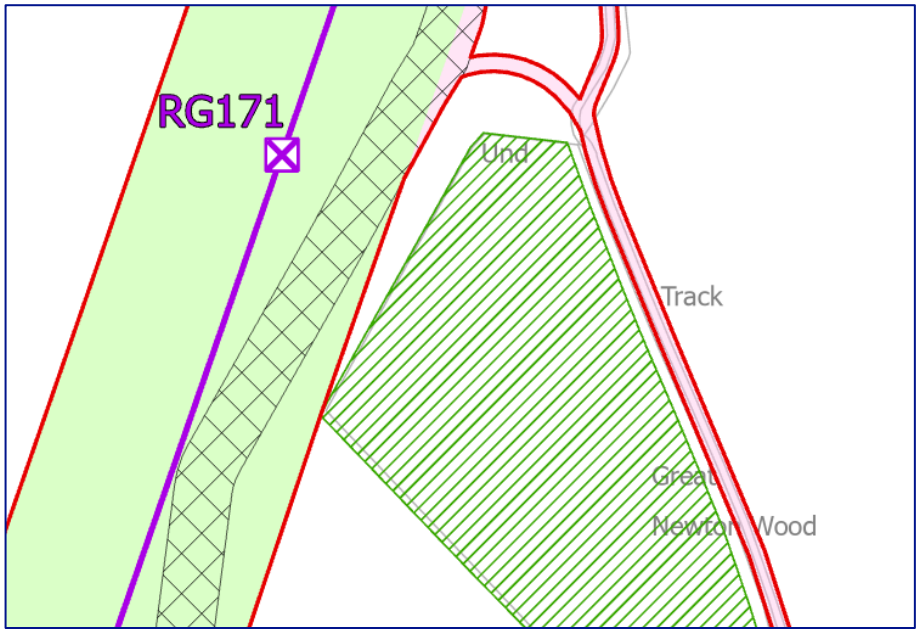


Figure 7.2 – Reduction of draft Order Limits by proposed pylon TB182 due to proximity of an ancient woodland.

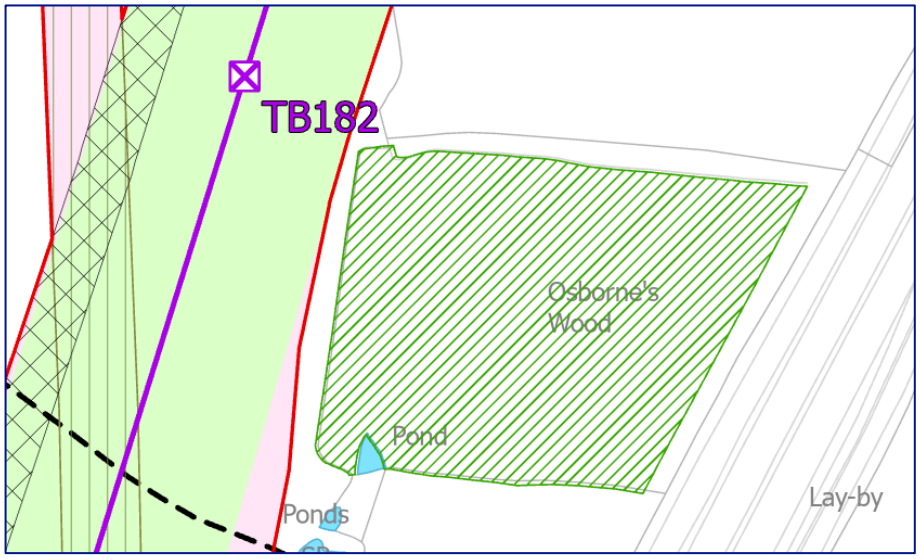


Figure 7.3 - Reduction of draft Order Limits at Black Brook for the watercourse crossing and residential properties.

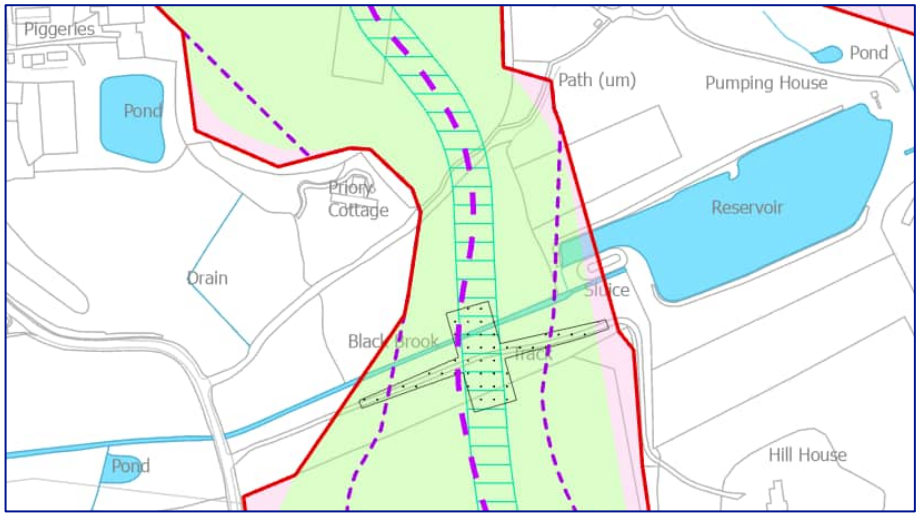


Figure 7.4 – Reduction of draft Order Limits south of Langham Hall for private residential property and gardens.

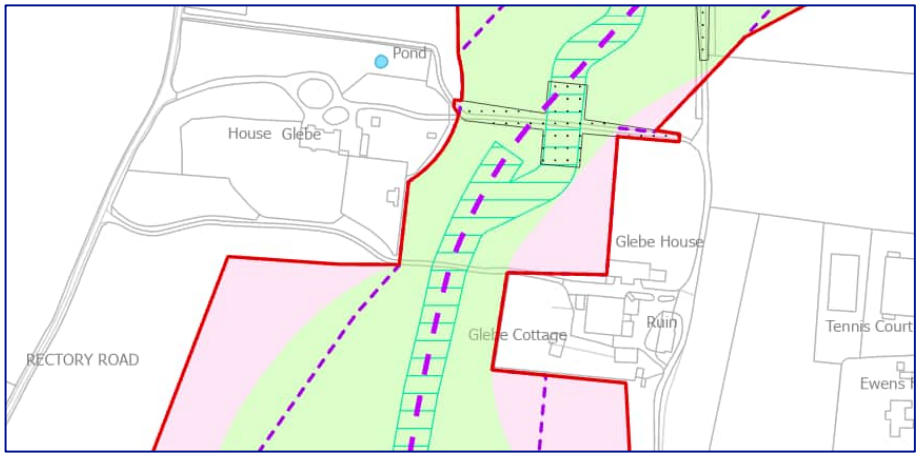


Figure 7.5 – Reduction of draft Order Limits at Parney Heath for private residential gardens.



7.2.5 Within the underground cable sections, the haul road would generally be positioned central to the alignment i.e., with underground cable trenches located either side of the haul road. In some locations, overhead line construction corridors would require access from the underground cable alignment corridors. In these locations, an overhead line bypass haul road is proposed to be constructed adjacent and parallel to the cable construction corridor to access the overhead line works directly. This would be provided to safely separate the overhead line construction vehicle movements from the works associated with the cable corridor construction.

7.2.6 Temporary construction compounds have been labelled on the plans by the reference ID highlighted in Table 7.1. The following types of compounds are proposed to facilitate construction of the Project:

- Main works compounds (overhead line);
- Satellite compounds (overhead line);
- Primary cable compounds;
- Secondary cable compounds;
- Tertiary cable and CSE compounds; and
- Substation compounds.

Table 7.1 - Proposed Construction Compounds

Compound Name (reference)	Project Section	Compound Type
Land to north of Norwich Substation, South Norfolk (RG-CC01)	Section A	Substation
Diss Road, near RG054, South Norfolk (RG-Sate1)	Section A	Satellite Compound (overhead line)
Land north of Fen Lane, Diss (RG-CC02)	Section A	Tertiary (CSE)
Land south of Fen Lane, Diss (RG-CC03)	Section A	Secondary (cable)
Land south of Ling Road, Diss (RG-CC04)	Section B	Tertiary (CSE)
Land south of Ling Road, Diss (RG-CC05)	Section B	Tertiary (cable)
Bury Road, near RG098, Mid Suffolk (RG-Main)	Section B	Main Works Compound (overhead line)
Site set back from Bells Lane, near RG150, Mid Suffolk (RG-Sate2)	Section B	Satellite Compound (overhead line)
Land to the east of Bramford Substation, Mid Suffolk (RG-CC06)	Section B	Substation

Compound Name (reference)	Project Section	Compound Type
Land east of Wenham Grove, north of Raydon (JC-CC01)	Section C	Tertiary (CSE)
Land off B1070, Babergh (JC-CC02)	Section C	Primary (cable)
Land south of Dedham Road, north of Langham (JC-CC03)	Section C	Secondary (cable)
Land south of Birchwood Road, to the west of Lamb Corner, Colchester (JC-CC04)	Section C	Primary (cable)
Land south of Little Bromley Road, Bradley Hall, Tendring (JC-CC05)	Section C	Secondary (cable)
Land at the EACN Substation, Tendring (JC-CC06)	Section C	Substation
Land east of Broad Lane, Colchester (TB-CC01)	Section D	Tertiary (CSE)
Land to the east of A134, Tye Green, Colchester (TB-CC02)	Section D	Tertiary (cable)
Land to west of A134, Tye Green, Colchester (TB-CC03)	Section D	Secondary (cable)
Land west of Crabtree Lane, north of Bellmead, Colchester (TB-CC04)	Section D	Tertiary (CSE)
Great Tey Road, near TB068, Colchester (TB-Sate1)	Section D	Satellite Compound (overhead line)
Land east of Fairstead Road, north of Fairstead (TB-CC05)	Section E	Tertiary (CSE)
Land west of Fairstead Road, north of Fairstead (TB-CC06)	Section E	Secondary (cable and CSE)
Off Braintree Road, near TB130, Chelmsford (TB-Main)	Section F	Main Works Compound (overhead line)
Land east of A131, near Sheepcotes Wood (TB-CC07)	Section F	Tertiary (CSE and cable)
Off Brentwood Road, near TB220, Basildon (TB-Sate2A)	Section G	Satellite Compound (overhead line)
Lower Dunton Road, near TB230, Basildon (TB-Sate2B)	Section H	Satellite Compound (overhead line)
Site north of Holford Road, adjacent to Orsett Golf Course, Thurrock (TB-CC08)	Section H	Tertiary (CSE)

Compound Name (reference)	Project Section	Compound Type
Site north of Muckingford Road, Thurrock (TB-CC09)	Section H	Tertiary (cable)
Site south of Cooper Shaw Road, Thurrock (TB-CC10)	Section H	Primary (cable)
Site to east of Tilbury Substation, Thurrock (TB-CC11)	Section H	Secondary (cable)
Site south of Tilbury Substation, Thurrock (TB-CC12)	Section H	Substation

7.3 Waveney Valley Alternative Consultation Plans

7.3.1 For the Waveney Valley Alternative an additional set of plans has been provided, to highlight the specifics of this alternative. The Waveney Valley alternative section slots in between the crossover of Section A & B.

7.4 Construction Access Plans

7.4.1 Details the Primary Access Routes for construction traffic access, showing the proposed routing, anticipated highway mitigation works and associated highway mitigation order limits at a more local scale. Associated information regarding the construction access can be found in the Draft Outline Construction Traffic Management Plan (available on the Project website).

7.4.2 The Highway Mitigation Order Limits displayed on these plans have been provided as an indicative boundary associated with locations where the anticipated scale of mitigation identified includes work outside the existing highway boundary, based upon the assumed public highway boundary extents. These plans do not show the draft Order Limits, these can be viewed on the Consultation Plans.

7.4.3 An additional Section outside of Sections A to H (shown in Figure 4.2), referred to as Section J, has been included within the Construction Access Plan set for routing relating to the Waveney Valley Alternative (WVA). Under the WVA proposal, the Primary Access Routes within Section J would be promoted for use by larger construction vehicles. This is proposed to be used in combination with the other Primary Access Routes in this location serving the 2024 preferred draft alignment.

7.4.4 Existing overhead utilities crossing the Primary Access Routes may be impacted by the proposed construction vehicles. The locations and details of proposed statutory undertaker works associated with these crossings are not included at this stage of design within the Construction Access Plans.

7.4.5 The individual constraints are uniquely referenced using the convention of XYY whereby:

- X refers to the Section that the constraint is located in; and
- YY is the reference number of the constraint within that Section.

7.4.6 The Construction Access Plans include references to Primary Access Routes and site access points, these references can be interpreted using the following identification codes:

7.4.7 Primary Access Routes are referenced using a naming convention of HXX-AY whereby:

- H refers to the haul road that the Primary Access Route is serving;
- XX is the reference number of the haul road section being served, numbered in ascending order from north to south; and
- A denotes that this is a Primary access route.

7.4.8 Y is the reference number of the primary access route within the haul road section, numbered in ascending order from north to south. For example, H05-A2 represents Primary Access Route two accessing haul road number five.

7.4.9 Similarly, Site Access Points and Crossovers (bellmouth) have been allocated location identifiers in ascending order from north to south using the convention of XX-BZZZ whereby:

- XX refers to that section of route (either RG, JC, or TB); and
- B refers to the form of access being a bellmouth junction; and ZZZ refers to the junction reference number. These are numbered in ascending order from north to south.

7.5 Environmental Constraint Plans

7.5.1 For the Waveney Valley Alternative an additional set of plans has been provided, to highlight the specifics of this alternative. The Waveney Valley alternative section slots in between the crossover of Section A & B.

7.5.2 One of the constraints featured in this plan set as represented in the legend is Countryside and Rights of Way Open Access Land, which is a combination of two source layers:

- CRoW Conclusive Registered Common Land – Shows land mapped as Conclusive Registered Common Land under the Countryside and Rights of Way (CRoW) Act 2000. The CRoW Act gives the public right of access to land mapped as 'open country' (mountain, moor, heath and down) or registered common land; and
- CRoW Access Land – Shows land mapped as access land under CRoW. The CRoW Act 2000 gives the public right of access to land mapped as 'open country' (mountain, moor, heath and down) or registered common land.

7.5.3 Both layers above are known as ‘open access land’.

7.6 Site Layout Drawings

7.6.1 These site layout drawings provide a more detailed look at the Project substations and CSE compounds. These plans indicate the location of the permanent CSE compound or substation and the works that are anticipated in the vicinity each site to support construction and ongoing operation. These drawings should be read in conjunction with the Consultation Plans and Construction Access Plans.

8. How can I provide feedback using the consultation plans?

8.1.1 The consultation plans can be viewed on th [redacted] nd at our public information events.

8.1.2 Your views are important to us and will help shape our plans as our project develops further. We welcome your feedback on all aspects of our design, including any geographical areas of interest.

8.1.3 You can provide your feedback through the following channels:

- Online: Fill in our feedback questionnaire online at: www.nationalgrid.com/norwich-to-tilbury.
- In paper copy: Visit us at one of our events to collect a paper copy feedback form, which can be completed and handed to the team. You can also collect a feedback form at a deposit location or request one by telephone or email.
- By email: You can send your comments or scanned electronic copies of our feedback questionnaire to contact@n-t.nationalgrid.com.
- By post: You can send your paper copy questionnaire or comments to: FREEPOST N TO T (please write this in capitals and you do not need a stamp).

8.1.4 You can use the consultation plans to identify geographical areas of interest along with the proposed new infrastructure in each section. You can then provide your feedback in the relevant section of the feedback questionnaire.

8.1.5 If you have any questions about the Project or require assistance with interacting with our consultation plans, please contact us using the details below:

- Email: contact@n-t.nationalgrid.com
- Freephone: 0800 915 2497

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

Registered in England and Wales
No. 4031152
nationalgrid.com

Appendix I16

PEIR Errata and Corrections Log

The Great Grid Upgrade

Norwich to Tilbury

Norwich to Tilbury

Preliminary Environmental Information Report – Errata and Corrections Log (June 2024)

nationalgrid

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Preliminary Environmental Information Report – Errata and Corrections Log (June 2024)

nationalgrid

1. Errata and Corrections Log (June 2024)

1.1 Overview

1.1.1 This errata and corrections log has been prepared to accompany the Preliminary Environmental Information Report (PEIR). It provides a list of minor corrections that have been noted in the PEIR since its issue as part of Statutory Consultation which commenced on the 10 April and is due to end on the 26 July 2024.

2. Corrections Log

2.1.1 Table 2.1 provides a list of corrections relating to Volume 2: Figures and figures within Volume 3: Technical Appendices of the PEIR. The revised figures can be found here.

2.1.2 In all cases, revisions to the figures to present the full extent of study areas do not affect the preliminary assessment in the PEIR. This is because the figures are visual representations of underlying data. The figures were not used to undertake the preliminary assessment.

Table 2.1: Volume 2: Figures and Volume 3: Technical Appendices

Volume	Figure	Correction
2	Figure 4.1 - Project Description - Proposed Project Design	Revision B between pages 12 and 13 has been reorientated to present the full extent of the project area. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 6.1 - Agriculture and Soils - Agriculture and Soils Study Area	Revision B has been reorientated to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 6.5 - Agriculture and Soils - Woodland Grant Schemes	Revision B has been reorientated to present the full extent of the study area. Pages 10 and 11 now present additional felling licence applications and woodland grant schemes obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 7.1 - Air Quality - Study Area and Constraints	An additional page has been added to Revision B to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 7.6 - Air Quality - Verification Modelling	Additional pages have been added to Revision B to present the full extent of the study area. Page 12 now presents an additional part of the road network verification layer. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.

Volume	Figure	Correction
2	Figure 8.2 - Ecology and Biodiversity - Non-Statutory Sites Designated for Biodiversity	Additional pages have been added to Revision B to present the full extent of the study area. Pages 3, 11, 12, 14, 17, 19, 20, 22, 26 and 29 now present additional parts of County Wildlife Sites (CWSs) and Local Wildlife Sites (LWSs) obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A8.1.2 - Ecology and Biodiversity - Protected - Notable Habitat and Plant Desk Study Map *within Appendix - 8.1 - Habitat Report*	Additional pages have been added to Revision B to present the full extent of the study area. Pages 11, 12, 14, 15, 17, 20, 22, 23, 24, 25 and 29 now present additional parts of inland watercourses, Ancient Woodland, records of bluebell and wild clary, an evergreen oak, records of alexanders and an area of deciduous woodland obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A8.2.2 – Ecology and Biodiversity - Terrestrial Invertebrate Survey Sites and Desk Study Records *within Appendix - 8.2 - Terrestrial Invertebrates Report*	Additional pages have been added to Revision B to present the full extent of the study area. Pages 12, 14, 15, 18, 20 and 26 now present additional records of stag beetle, moths, white-letter hairstreak, ‘other’ invertebrate and small heath obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A8.3.1 - Ecology and Biodiversity - Reptiles Desk Study Records, and Statutory and Non-Statutory Designated Sites Within 2km of the Draft Order Limits *within Appendix - 8.3 - Reptile Report*	An additional page has been added to Revision B to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A8.4.1 - Ecology and Biodiversity - Study Area of Breeding Bird Desk *within Appendix - 8.4 - Breeding Bird Report*	Revision B has been reorientated to present the full extent of the study area. Page 2 now presents an additional part of a Special Protection Area (SPA) obtained from a third party. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.

Volume	Figure	Correction
3	Figure A8.5.2 - Ecology and Biodiversity - International Designated Sites of Ornithological Importance *within Appendix - 8.5 - Wintering, Passage Bird Report*	Revision B has been reorientated to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A8.6.1 - Ecology and Biodiversity - Desk Study Bat Records *within Appendix - 8.6 - Bat Roosting Report*	Additional pages have been added to Revision B to present the full extent of the study area. Pages 6 and 8 now present additional bat activity records and a bat roost record received from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A8.8.1 - Ecology and Biodiversity - Dormouse Desk Study Records and Survey Locations *within Appendix - 8.8 - Hazel Dormouse Report*	Additional pages have been added to Revision B to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A8.9.1 – Ecology and Biodiversity - Otter and Water Vole Desk Study Records, Statutory and Non-statutory Sites *within Appendix - 8.9 - Otter and Water Vole Report*	An additional page has been added to Revision B to present the full extent of the study area. The area contains no data associated with the proposals but has been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A8.10.1 - Ecology and Biodiversity - Species of Principal Importance Records Within 2km of Draft Order Limits *within Appendix - 8.10 - Species of Principal Importance Report*	An additional page has been added to Revision B to present the full extent of the study area. The area contains no data associated with the proposals but has been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.

Volume	Figure	Correction
3	Figure A8.11.1 - Ecology and Biodiversity - Badger Report - Badger Records and Badger Sett Locations Recorded *within Appendix - 8.11 - Badger Report (Confidential)*	An additional page has been added to Revision B to present the full extent of the study area. The area contains no data associated with the proposals but has been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 9.5 - Contaminated Land, Geology and Hydrogeology - Hydrogeology and Hydrogeological Receptors	Revision B has been reorientated to present the full extent of the study area. Pages 10, 13 and 14 now present an additional part of an outer zone of a source protection zone (SPZ) obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 11.1 - Historic Environment - Study Area	Additional pages have been added to Revision B to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 11.2 - Historic Environment Designated Heritage Assets and Protected Lanes within Study Area	Additional pages have been added to Revision B to present the full extent of the study area. Page 8 now presents an additional Scheduled Monument and two listed buildings obtained from a third party. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A11.1 – Historic Environment - Designated and Non-Designated Heritage Assets *within Appendix - 11.1 - Historic Environment Desk-Based Assessment*	Revision B has been re-scaled and an additional page included to present the full extent of the study area. Pages 1, 2, 3, 5, 8, 9, 10, 12, 14, 16, 17, 18, 19, 20, 21, 23, 25 and 26 now present additional non-designated assets, parts of Conservation Areas, Listed Buildings and Scheduled Monuments obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 12.1 - Hydrology and Land Drainage - Study Area and Water Environment Features	Revision B has been reorientated to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.

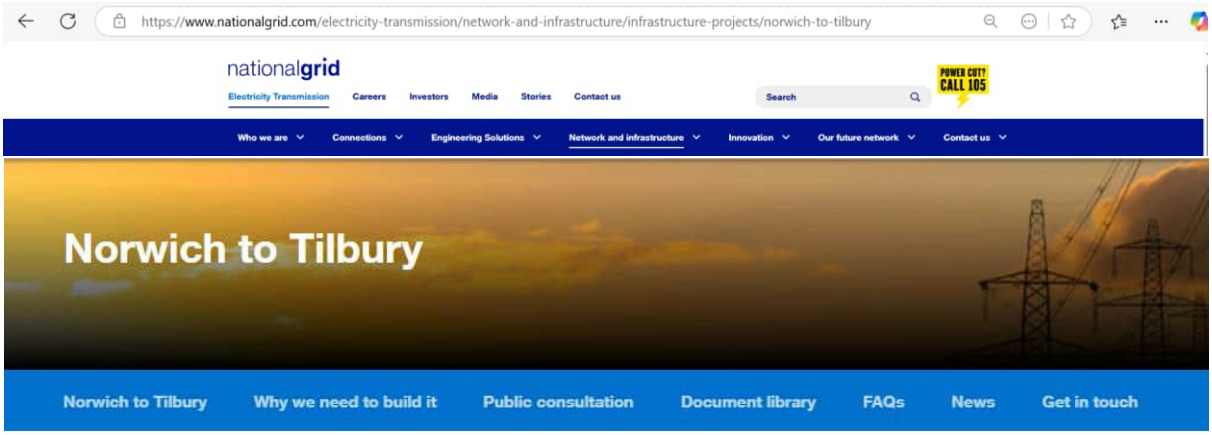
Volume	Figure	Correction
2	Figure 12.2 - Hydrology and Land Drainage - Flood Risk Areas	Revision B has been reorientated to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure12.3 - Hydrology and Land Drainage - Water Framework Surface Waterbody Status	Revision B has been reorientated to present the full extent of the study area. Page 14 now includes an additional part of the boundary of a Water Framework Directive River Waterbody Catchment boundary obtained from a third party. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.1 - Landscape and Visual LVIA Study Area and Landscape Designations	An additional page has been added to Revision B to present the full extent of the study areas. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.2 - Landscape and Visual Landform and Drainage	An additional page has been added to Revision B to present the full extent of the study areas. Pages 1, 7, 8 and 9 now present additional elevation information obtained from a third party. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.3 - Landscape and Visual Trees and Woodland	An additional page has been added to Revision B to present the full extent of the study areas. Pages 7, 8 and 9 now present additional National Forest Inventory Woodland and Ancient Woodland information obtained from a third party. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.4 - Landscape and Visual Settlements and Infrastructure	An additional page has been added to Revision B to present the full extent of the study areas. Pages 1, 7, 8 and 9 now present an additional part of the settlement of Bunwell, part of the Dedham Vale National Landscape (formerly Dedham Vale Area of Outstanding Natural Beauty (AONB)) and part of two B roads. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.5 - Landscape and Visual National Character Areas	An additional page has been added to Revision B to present the full extent of the study areas. Pages 1, 7, 8 and 9 now present additional parts of ‘Wooded Plateau Claylands’, ‘Lowland Settled and Claylands Valley Meadowlands’, ‘Valley Settled Farmlands and Wooded Hills and Ridges’ and ‘Wooded Plateau Farmlands and

Volume	Figure	Correction
	and East of England Typology	Valley Settled Farmlands' obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.6 - Landscape and Visual Landscape Character Types and Landscape Character Areas	An additional page has been added to Revision B to present the full extent of the study areas. Pages 1, 7, 8 and 9 now present additional parts of Landscape Character Types and Landscape Character Areas obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.7 - Landscape and Visual - Visual Receptors	An additional page has been added to Revision B to present the full extent of the study areas. Pages 1, 7, 8 and 9 now present an additional part of the settlement of Bunwell, parts of a number of Public Rights of Way (PRoW), part of a National Cycle Network route and part of an A road obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.8.1 - Landscape and Visual - Zone of Theoretical Visibility (ZTV) of Proposed 400kV Overhead Line	Additional pages have been added to Revision B to present the full extent of the 3km study area and the 5km buffer included for context. Pages 1, 2, 8, 9 and 10 now present an additional part of the settlement of Bunwell, part of the Dedham Vale National Landscape (formerly Dedham Vale AONB) and woodland blocks (obtained from third parties). This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.8.2 - Landscape and Visual - Zone of Theoretical Visibility (ZTV) of Proposed 400kV Overhead Line	Additional pages have been added to Revision B to present the full extent of the 3km study area and the 5km buffer included for context. Pages 1, 7, 8 and 9 now present an additional part of the settlement of Bunwell, part of the Dedham Vale National Landscape (formerly Dedham Vale AONB) and woodland blocks (obtained from third parties). This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.8.6 - Landscape and Visual - ZTV of Cable Sealing End (CSE) Compound north of Dedham Vale National Landscape	Revision B has been re-scaled to present the full extent of the 3km study areas on page 1. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.

Volume	Figure	Correction
2	Figure 14.1 - Noise and Vibration - Baseline Noise Data	Revision B has been reorientated to present the full extent of the study area. Page 14 now presents an additional part of an outer limit noise contour associated with an existing road obtained from a third party. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 15.2 - Socio-economics, Recreation and Tourism - Business, Recreation and Tourism Assets	Revision B has been reorientated to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 17.2 - Cumulative Effects - Cumulative Short List of Other Developments	Additional pages have been added to Revision B to present the full extent of the study area. Pages 7 and 13 now present an additional part of the North Falls, Five Estuaries and Lower Thames Crossing Nationally Significant Infrastructure Projects. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure 2 - Flood Risk Areas *within Appendix - 12.2 - Flood Risk Assessment Screening*	Revision B has been reorientated to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.

Appendix I17

[redacted]



The Norwich to Tilbury project will support the UK's net zero target through the connection of new low carbon energy generation and by reinforcing the region's transmission network.

Norwich to Tilbury is a proposal by National Grid Electricity Transmission (National Grid) to reinforce the high voltage power network in East Anglia between the existing substations at Norwich Main in Norfolk, Bramford in Suffolk, and Tilbury in Essex, as well as connect new offshore wind generation.

We are proposing to build approximately 184 km of new electricity transmission reinforcement between Norwich and Tilbury. This will be made up mostly of overhead line and pylons, along with some underground cables and a new 400 kV substation. Our proposals are part of **The Great Grid Upgrade** – the largest overhaul of the grid in generations.

Norwich to Tilbury will play a vital role in delivering electricity efficiently, reliably, and safely and will support the UK's move to reduce carbon emissions.

The way we generate electricity in the UK is changing rapidly and we're transitioning to cheaper, cleaner and more secure forms of energy, like new offshore windfarms. We need to make changes to the network of overhead lines, pylons, cables and other infrastructure that transports electricity around the country, so that everyone has access to the clean electricity from these new renewable sources.

The Government has set a commitment to reach net zero greenhouse gas emissions by 2050 and an ambition to connect 50 GW of offshore wind by 2030 – enough energy to power every home in the country.

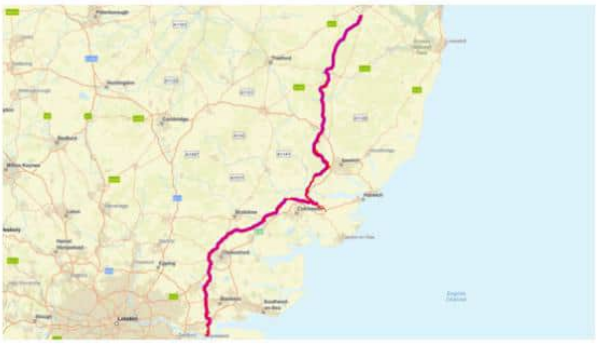
To achieve this, offshore wind is being developed at scale and around 60% of the current offshore wind projects will come ashore along the East Coast.

Couple this with new nuclear generation proposed at Sizewell C and greater interconnection with countries across the North Sea, we expect to see a significant increase in the level of renewable and low carbon electricity generation connecting in East Anglia.

While our existing high voltage electricity network in East Anglia has been sufficient until today, it doesn't have the capability needed to reliably and securely transport all the energy that will be connected by 2030 while working to the required standards.

In the first half of this decade, we are investing significantly in upgrading the existing network, but that still won't deliver the capability that is needed. We need to reinforce the region's network and to increase the network capability to carry the clean green energy that is proposed.

We are committed to working with local communities as we develop our plans. We want local residents to have the opportunity to access the new jobs, business opportunities and positive biodiversity and environmental improvements that The Great Grid Upgrade can deliver.



Norwich to Tilbury map

View the full interactive map of the route.

View interactive map

Why we need Norwich to Tilbury?

East Anglia's 400,000 volts (400 kV) electricity transmission network was built in the 1960s to supply regional demand, centred around Norwich and Ipswich. With the growth in new energy generation from offshore wind, nuclear power and interconnection with other countries, there will be more electricity connected in East Anglia than the network can currently accommodate.

Over the next decade we expect over 15,000 MW of new generation and 4,500 MW of new interconnection will need to connect in the region.

This includes:

- **new offshore wind farms connecting into Necton and Norwich**
- **Five Estuaries and North Falls offshore wind farms: both currently in development off the east coast and expected to be in operation by 2030**
- **Tarchon Energy interconnector: 1,400 MW interconnector between UK and Germany, proposed to connect at the Tendring Peninsula.**

In its current state, the high voltage electricity network in East Anglia doesn't have sufficient capacity to accommodate this new generation which is why Norwich to Tilbury is needed.

Our proposals include building a new 400,000 volts (400 kV) electricity overhead transmission line, work at existing substations and building a new substation to connect new proposed offshore wind farms to the electricity transmission network.

Nationally significant infrastructure projects

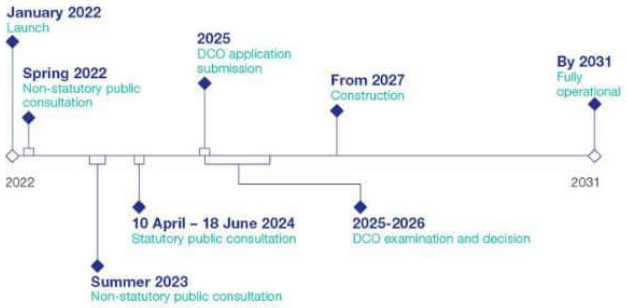
Certain types of energy infrastructure fall within the categories of Nationally Significant Infrastructure Projects (NSIPs), which require a Development Consent Order (DCO) under the Planning Act 2008. As our current plans propose more than 2 km of overhead line, we expect the project would be classified as an NSIP.

Both this consultation and the consultation we held in spring 2022 are 'non-statutory'. We are delivering our consultations in line with Government guidance for consulting on NSIPs. As part of the DCO process, we would also carry out a 'statutory' consultation before submitting a DCO application. All feedback received will be recorded and reported in our final Consultation Report, including how we have had regard to your comments. The Consultation Report would form part of our application for development consent.

Further information on the DCO process is available on the **Planning Inspectorate's website**.

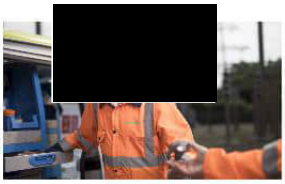
Project Timeline

The indicative timeline below details our anticipated development programme, including when we will consult on our proposals and when you will be able to share your views.



Indicative timeline for the Norwich to Tilbury project. View larger image.

More information



How we develop projects

Learn more about how National Grid develops projects



Our proposals

View our development programme and next steps.



Information for landowners

Read information for landowners and persons with an interest in land related to the project.



Public consultation

Learn more about our third stage of consultation and view an interactive map of our proposals



About Norwich to Tilbury

What we know so far and why the project is needed.



Document library

View all documentation and materials for Norwich to Tilbury.



Frequently asked questions

Find answers to the frequently asked questions.



Contact us

Get in touch with our Community Relations team.



Public consultation and programme

We are consulting on our proposals for Norwich to Tilbury, which include:

- the preferred draft alignment for a new 400 kilovolts (kV) electricity transmission connection of around 184 kilometres (km) running from Norwich Main Substation to Tilbury Substation via Bramford Substation including approximately 159 km of new overhead line and approximately 25 km of underground cabling
- six new Cable Sealing End (CSE) compounds (where high-voltage underground cables join onto an overhead line) and associated permanent accesses
- a new East Anglia Connection Node (EACN) 400 kV substation, which would connect clean energy from offshore wind generation to the energy network so the energy can reach homes and businesses where it's needed.
- an alternative design at Waveney Valley, substituting approximately 2 km of pylons with underground cabling
- substation extension works at the existing Norwich Main, and Bramford substations and works within the existing Tilbury Substation
- temporary works including access roads, tracks, compounds and associated with the project's construction.

We are also consulting on the preliminary findings from our environmental studies and assessments as well as proposed mitigation for any potential impacts to the local environment, including animal habitats and the local landscape.

Temporary construction requirements

Building the project would involve a range of temporary construction activities. These would include preparing land and creating temporary haul roads to access work areas as well as providing temporary areas to store materials, vehicles and staff welfare facilities. Our red line boundary – the geographic extent of the project as shown on our interactive map and plans – includes the areas proposed for construction. We welcome views and comments as part of this consultation.

Waveney Valley

In response to feedback from our previous consultation, we are consulting on proposals for an alternative design (in addition to proposals for an overhead line) at Waveney Valley.

This alternative design would include the installation of approximately 2 km of underground cabling (and the substitution of 2 km of overhead lines from our proposals) and two CSE compounds (to join the high-voltage underground cables onto the overhead line) with associated access roads. This would increase the number of CSE compounds from six to eight. While underground cabling would reduce landscape, communal outdoor spaces such as parks and playgrounds and places of historical interest and importance in the area, it would have an impact on ecology, archaeology and peat soils, and come at an additional cost.

We welcome feedback on both of the proposals at this consultation.

Taking part

During statutory consultation, we're holding a series of public information events and webinars. You can find out how you can attend these below. We have also published detailed information on our project.

You can see all our consultation materials on this website within our document library. You can also explore our proposals in detail via **our interactive project map**. Paper copies of documents will be available to view at public information events and a selection can be found at inspection points, which are public places anyone can access outside of consultation events where they can inspect project documents. A list of these locations can be found below.

We want to hear your views, you can provide feedback by:

- completing the online feedback questionnaire here
- emailing your comments to: contact@n-t.nationalgrid.com
- posting your written responses (no stamp required) to: FREEPOST N TO T
- completing a paper feedback questionnaire and return it using the freepost address.

You can pick up paper copies of our feedback questionnaires at our public information events or at the inspection points listed below. You can also request a copy by calling us on 0800 915 2497.

We have produced an interactive Project map detailing our proposals for Norwich to Tilbury. This is to make it easier to identify which area is most relevant to you.

Public information events

Throughout the consultation we are holding a series of face-to-face events. Our public information events are being held across the local area. Information about our proposals will be on display, including our interactive map, as well as copies of maps and technical documents. Members of the project team will be available to talk through our proposals and answer any questions.

*Please note that some of the venues may be busy at peak times. Larger venues are marked with an * where there will be more room to view project materials and digital information.*

Date and time	Venue
Wednesday 24 April 2024 12-5pm	Towngate Theatre, St Martin's Square, Basildon, Essex SS14 1DL
Thursday 25 April 2024 2-7pm	The Brentwood Centre, Doddinghurst Road, Pilgrims Hatch, Brentwood, CM15 9NN *
Saturday 27 April 2024 11am-4pm	Chelmsford City Racecourse, Chelmsford, CM3 1QP *
Tuesday 30 April 2024 12-5pm	Gislingham Village Hall, Mill Street, Gislingham, IP23 8JT
Wednesday 1 May 2024 11am-4pm	Copdock Village Hall, Old London Road, Copdock, IP8 3JN
Friday 3 May 2024 1-6pm	Needham Market Community Centre, School St, Needham Market, Ipswich IP6 8BB
Saturday 4 May 2024 11am-4pm	Lawford Venture Centre 2000, Bromley Road, Lawford, Manningtree CO11 2JE
Wednesday 8 May 2-7pm	The Civic Hall, Blackshots Lane, Grays, RM16 2JU *
Thursday 9 May 2024 1-6pm	Thorpe Hall, Ashwell Thorpe and Fundenhall Community Centre, Muskett Road, Ashwellthorpe, NR16 1FD
Friday 10 May 2024 1-6pm	Tibenham Community Hall, Pristow Green Lane, Tibenham, Norwich NR16 1PX
Tuesday 14 May 2024 11am-4pm	Witham Public Hall, Collingwood Road, Witham, CM8 2DY
Wednesday 15 May 2024 1-6pm	Diss Town Football Club, Diss, IP22 4QP
Thursday 16 May 2024 2-7pm	Langham Community Centre, School Road, Langham, Colchester, CO4 5PA
Friday 17 May 2024 1-6pm	Great Bromley Village Hall, Parsons Hill, Great Bromley, Colchester, CO7 7JA

Webinars

You can attend one of our six online webinar sessions, where we will present details of our proposals and you can ask the team questions. To sign up, pick your preferred webinar in the table below and click the link to register.

If you require further assistance on how to sign up for a webinar (using the software 'MS Teams Webinar'), please contact the Community Relations team by phone on 0800 915 2497 or email at contact@n-t.nationalgrid.com.

Date and time	Topic	Registration link
Wednesday 17 April 6-7pm	Project Overview One*	Register here
Wednesday 29 May 6-7pm	Section A and B - South Norfolk and Mid Suffolk	Register here
Thursday 30 May 6-7pm	Section C and D - Babergh, Tendring and Colchester	Register here
Wednesday 5 June 6-7pm	Section E and F – Braintree and Chelmsford	Register here
Thursday 6 June 6-7pm	Section G and H – Basildon, Brentwood and Thurrock	Register here
Wednesday 12 June 6-7pm	Project Overview Two	Register here

* A British Sign Language interpreter will be available.

Inspection points

Paper copies of the consultation newsletter and feedback questionnaire are available to collect from one of the following local inspection points. These are located within or in close proximity to the emerging preferred corridor and can be collected from the start of and throughout the consultation period.

Reference copies of the 2024 Project Background Document and the Non-Technical Summary (NTS) of the Preliminary Environmental Impact Report (PEIR) are also available at the inspection points.

Inspection point opening hours can be subject to change. Please check with the relevant venue for the most up to date opening hours. If you require access to the library during unstaffed hours, you will need to use your library card to enter the building.

Location	Address	Opening hours
Long Stratton Library	The Street Long Stratton NR15 2XJ	Monday - 11am-7pm Tuesdays 1pm-7pm Wednesday - 8am-7pm (unstaffed) Thursday - 1pm-7pm Friday - 8am-7pm (unstaffed) Saturday 11am-4pm Sunday - 10am-4pm (unstaffed)
Norwich Library	Unit 3 The Forum Millenium Plain Norwich NR2 1AW	Monday - Friday - 10am-7pm Saturday - 9am-5pm
Tuckswood Library	Robin Hood Road Eaton NR4 6BX	Monday - 8am – 7pm (unstaffed) Tuesday - 11am-7pm Wednesday - 8am-7pm (unstaffed) Thursday - 8am-7pm (unstaffed) Friday - 11am-7pm Saturday - 10am-4pm Sunday - 10am-4pm (unstaffed)
Diss Library	Church Street Diss IP22 4DD	Monday - 10am-7pm Tuesday – 8am-7pm Wednesday - 10am-7pm Thursday - 10am-7pm Friday - 10am-7pm Saturday - 10am-7pm Sunday – 10am-4pm
Stowmarket Library	Milton Road Stowmarket IP14 1EX	Monday - Closed Tuesday - 8.30am-6.45pm Wednesday - 8.30am-5.45pm Thursday - 8.30am-5.45pm Friday - 8.30am-6.30pm Saturday - 8.30am-4pm Sunday - 10am-4pm
Capel St Mary Library	Village Hall The Street Capel St Mary IP9 2EF	Monday - Closed Tuesday - 9am-12.30pm, 2-5.30pm Wednesday and Thursday - 9am-12.30pm Friday - 2-5.30pm Saturday - 9am-3pm Sunday - 10am-3pm
Coggeshall Library	The Friends Meeting House Stoneham Street Coggeshall CO6 1UH	Monday - Closed Tuesday - 2-5.30pm Wednesday - Closed Thursday - 9am-5.30pm Friday - Closed Saturday - 9am-5pm Sunday – Closed
Chelmsford Library	Market Road Chelmsford CM1 1QH	Monday - 9am-5.30pm Tuesday - 9am-5.30pm Wednesday - 9am-5.30pm Thursday - 9am-7pm Friday - 9am-5.30pm Saturday - 9am-5pm Sunday - 10.30am-1.30pm
Colchester Library	Trinity Square Colchester CO1 1JB	Monday - 9am-5.30pm Tuesday - 9am-5.30pm Wednesday - 9am-7pm Thursday - 9am-5.30pm Friday - 9am-5.30pm Saturday - 9am-5pm Sunday - 1-4pm

Tilbury Library	Civic Square Tilbury RM18 8AD	Monday - 10am-1pm and 2-5pm Tuesday - Closed Wednesday - 10am-1pm and 2-5pm Thursday - Sunday - Closed
Greenstead Library	Hawthorn Avenue Colchester CO4 3QE	Monday - 9am-5.30pm Tuesday - 9am-5.30pm Wednesday - Closed Thursday - 9am-5.30pm Friday - Closed Saturday - 9am-5pm Sunday - Closed
Stanway Library	10 Villa Road Stanway CO3 0RH	Monday - Closed Tuesday - 2-7pm Wednesday - Closed Thursday - 9am-1pm Friday - Closed Saturday - 9am-1pm Sunday - Closed
Prettygate Library	Prettygate Road Colchester CO3 4EQ	Monday - Closed Tuesday - 9am-7pm Wednesday - 9am-5.30pm Thursday - Closed Friday - 9am-5.30pm Saturday - 9am-5pm Sunday - Closed
Wivenhoe Library	104/6 High Street Wivenhoe CO7 9AB	Monday - Closed Tuesday - 2-7pm Wednesday - Closed Thursday - 9am-5.30pm Friday - Closed Saturday - 9am-5pm Sunday - Closed

Contact us

Get in touch with our Community Relations team.



Interactive map

View an interactive map of our proposals for Norwich to Tilbury



Frequently Asked Questions

Find out more about the project with our Frequently Asked Questions.



Document library

View all documentation and materials for Norwich to Tilbury.



Contact us

Get in touch with our Community Relations team.



Norwich to Tilbury

Document library

On this page you can continue to view all our project documents. This includes information on our 2025 targeted consultations, the documents we published for statutory consultation: our 2024 Project Background Document, Preliminary Environmental Information Report (PEIR) and Non-technical Summary of the PEIR (NTS of the PEIR), as well as our 2024 Design Development Report and 2024 Strategic Options Backcheck and Review which provides an overview of the appraisal approach we have used to date to consider strategic options for Norwich to Tilbury.

Project documents and maps

Targeted consultations (09)

Project updates (17)

Statutory consultation 2024 documents (46)

Statutory consultation 2024 plans (45)

Summer 2023 consultation plans and documents (10)

Summer 2023 consultation plans (16)

Spring 2022 consultation documents (7)

Landowner publications (7)

Statutory consultation 2024 documents

Name

- Norwich to Tilbury - Project Background Document
- Norwich to Tilbury - Guide to Interacting with Our Consultation Plans
- Norwich to Tilbury - Strategic Options Back Check and Review
- Norwich to Tilbury - Design Development Report
- Norwich to Tilbury - Design Development Report Appendices
- Norwich to Tilbury - 2023 - Non-Statutory Consultation Feedback Report
- Norwich to Tilbury - 2023 Non-Statutory Consultation Feedback Report Appendices
- Norwich to Tilbury - Community Newsletter
- Norwich to Tilbury - Community Newsletter Map
- Norwich to Tilbury - Feedback Questionnaire
- Norwich to Tilbury - Statement of Community Consultation
- Norwich to Tilbury - Consultation Event Materials - Consultation Banners
- Norwich to Tilbury - Section 47 Notice
- Norwich to Tilbury - Section 48 notice
- PEIR Errata and Corrections Log - June 2024
- Norwich to Tilbury - Preliminary Environmental Information Report - Non Technical Summary
- Norwich to Tilbury - Preliminary Environmental Information Report - Volume 1 - Main Text
- Norwich to Tilbury - Preliminary Environmental Information Report - Volume 2 - Figures
- Norwich to Tilbury - Preliminary Environmental Information Report - Volume 2 Figures 6.3 - 6.5
- Norwich to Tilbury - Preliminary Environmental Information Report - Volume 2 - Figures 6.6 - 7.3

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Description of 2024 consultation documents

Appendix I18

PEIR Errata and Corrections Log

The Great Grid Upgrade

Norwich to Tilbury

Norwich to Tilbury

Preliminary Environmental Information Report – Errata and Corrections Log (June 2024)

nationalgrid

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Preliminary Environmental Information Report – Errata and Corrections Log (June 2024)

nationalgrid

1. Errata and Corrections Log (June 2024)

1.1 Overview

1.1.1 This errata and corrections log has been prepared to accompany the Preliminary Environmental Information Report (PEIR). It provides a list of minor corrections that have been noted in the PEIR since its issue as part of Statutory Consultation which commenced on the 10 April and is due to end on the 26 July 2024.

2. Corrections Log

2.1.1 Table 2.1 provides a list of corrections relating to Volume 2: Figures and figures within Volume 3: Technical Appendices of the PEIR. The revised figures can be found here.

2.1.2 In all cases, revisions to the figures to present the full extent of study areas do not affect the preliminary assessment in the PEIR. This is because the figures are visual representations of underlying data. The figures were not used to undertake the preliminary assessment.

Table 2.1: Volume 2: Figures and Volume 3: Technical Appendices

Volume	Figure	Correction
2	Figure 4.1 - Project Description - Proposed Project Design	Revision B between pages 12 and 13 has been reorientated to present the full extent of the project area. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 6.1 - Agriculture and Soils - Agriculture and Soils Study Area	Revision B has been reorientated to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 6.5 - Agriculture and Soils - Woodland Grant Schemes	Revision B has been reorientated to present the full extent of the study area. Pages 10 and 11 now present additional felling licence applications and woodland grant schemes obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 7.1 - Air Quality - Study Area and Constraints	An additional page has been added to Revision B to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 7.6 - Air Quality - Verification Modelling	Additional pages have been added to Revision B to present the full extent of the study area. Page 12 now presents an additional part of the road network verification layer. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.

Volume	Figure	Correction
2	Figure 8.2 - Ecology and Biodiversity - Non-Statutory Sites Designated for Biodiversity	Additional pages have been added to Revision B to present the full extent of the study area. Pages 3, 11, 12, 14, 17, 19, 20, 22, 26 and 29 now present additional parts of County Wildlife Sites (CWSs) and Local Wildlife Sites (LWSs) obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A8.1.2 - Ecology and Biodiversity - Protected - Notable Habitat and Plant Desk Study Map *within Appendix - 8.1 - Habitat Report*	Additional pages have been added to Revision B to present the full extent of the study area. Pages 11, 12, 14, 15, 17, 20, 22, 23, 24, 25 and 29 now present additional parts of inland watercourses, Ancient Woodland, records of bluebell and wild clary, an evergreen oak, records of alexanders and an area of deciduous woodland obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A8.2.2 – Ecology and Biodiversity - Terrestrial Invertebrate Survey Sites and Desk Study Records *within Appendix - 8.2 - Terrestrial Invertebrates Report*	Additional pages have been added to Revision B to present the full extent of the study area. Pages 12, 14, 15, 18, 20 and 26 now present additional records of stag beetle, moths, white-letter hairstreak, ‘other’ invertebrate and small heath obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A8.3.1 - Ecology and Biodiversity - Reptiles Desk Study Records, and Statutory and Non-Statutory Designated Sites Within 2km of the Draft Order Limits *within Appendix - 8.3 - Reptile Report*	An additional page has been added to Revision B to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A8.4.1 - Ecology and Biodiversity - Study Area of Breeding Bird Desk *within Appendix - 8.4 - Breeding Bird Report*	Revision B has been reorientated to present the full extent of the study area. Page 2 now presents an additional part of a Special Protection Area (SPA) obtained from a third party. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.

Volume	Figure	Correction
3	Figure A8.5.2 - Ecology and Biodiversity - International Designated Sites of Ornithological Importance *within Appendix - 8.5 - Wintering, Passage Bird Report*	Revision B has been reorientated to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A8.6.1 - Ecology and Biodiversity - Desk Study Bat Records *within Appendix - 8.6 - Bat Roosting Report*	Additional pages have been added to Revision B to present the full extent of the study area. Pages 6 and 8 now present additional bat activity records and a bat roost record received from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A8.8.1 - Ecology and Biodiversity - Dormouse Desk Study Records and Survey Locations *within Appendix - 8.8 - Hazel Dormouse Report*	Additional pages have been added to Revision B to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A8.9.1 – Ecology and Biodiversity - Otter and Water Vole Desk Study Records, Statutory and Non-statutory Sites *within Appendix - 8.9 - Otter and Water Vole Report*	An additional page has been added to Revision B to present the full extent of the study area. The area contains no data associated with the proposals but has been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A8.10.1 - Ecology and Biodiversity - Species of Principal Importance Records Within 2km of Draft Order Limits *within Appendix - 8.10 - Species of Principal Importance Report*	An additional page has been added to Revision B to present the full extent of the study area. The area contains no data associated with the proposals but has been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.

Volume	Figure	Correction
3	Figure A8.11.1 - Ecology and Biodiversity - Badger Report - Badger Records and Badger Sett Locations Recorded *within Appendix - 8.11 - Badger Report (Confidential)*	An additional page has been added to Revision B to present the full extent of the study area. The area contains no data associated with the proposals but has been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 9.5 - Contaminated Land, Geology and Hydrogeology - Hydrogeology and Hydrogeological Receptors	Revision B has been reorientated to present the full extent of the study area. Pages 10, 13 and 14 now present an additional part of an outer zone of a source protection zone (SPZ) obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 11.1 - Historic Environment - Study Area	Additional pages have been added to Revision B to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 11.2 - Historic Environment Designated Heritage Assets and Protected Lanes within Study Area	Additional pages have been added to Revision B to present the full extent of the study area. Page 8 now presents an additional Scheduled Monument and two listed buildings obtained from a third party. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure A11.1 – Historic Environment - Designated and Non-Designated Heritage Assets *within Appendix - 11.1 - Historic Environment Desk-Based Assessment*	Revision B has been re-scaled and an additional page included to present the full extent of the study area. Pages 1, 2, 3, 5, 8, 9, 10, 12, 14, 16, 17, 18, 19, 20, 21, 23, 25 and 26 now present additional non-designated assets, parts of Conservation Areas, Listed Buildings and Scheduled Monuments obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 12.1 - Hydrology and Land Drainage - Study Area and Water Environment Features	Revision B has been reorientated to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.

Volume	Figure	Correction
2	Figure 12.2 - Hydrology and Land Drainage - Flood Risk Areas	Revision B has been reorientated to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure12.3 - Hydrology and Land Drainage - Water Framework Surface Waterbody Status	Revision B has been reorientated to present the full extent of the study area. Page 14 now includes an additional part of the boundary of a Water Framework Directive River Waterbody Catchment boundary obtained from a third party. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.1 - Landscape and Visual LVIA Study Area and Landscape Designations	An additional page has been added to Revision B to present the full extent of the study areas. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.2 - Landscape and Visual Landform and Drainage	An additional page has been added to Revision B to present the full extent of the study areas. Pages 1, 7, 8 and 9 now present additional elevation information obtained from a third party. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.3 - Landscape and Visual Trees and Woodland	An additional page has been added to Revision B to present the full extent of the study areas. Pages 7, 8 and 9 now present additional National Forest Inventory Woodland and Ancient Woodland information obtained from a third party. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.4 - Landscape and Visual Settlements and Infrastructure	An additional page has been added to Revision B to present the full extent of the study areas. Pages 1, 7, 8 and 9 now present an additional part of the settlement of Bunwell, part of the Dedham Vale National Landscape (formerly Dedham Vale Area of Outstanding Natural Beauty (AONB)) and part of two B roads. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.5 - Landscape and Visual National Character Areas	An additional page has been added to Revision B to present the full extent of the study areas. Pages 1, 7, 8 and 9 now present additional parts of ‘Wooded Plateau Claylands’, ‘Lowland Settled and Claylands Valley Meadowlands’, ‘Valley Settled Farmlands and Wooded Hills and Ridges’ and ‘Wooded Plateau Farmlands and

Volume	Figure	Correction
	and East of England Typology	Valley Settled Farmlands' obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.6 - Landscape and Visual Landscape Character Types and Landscape Character Areas	An additional page has been added to Revision B to present the full extent of the study areas. Pages 1, 7, 8 and 9 now present additional parts of Landscape Character Types and Landscape Character Areas obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.7 - Landscape and Visual - Visual Receptors	An additional page has been added to Revision B to present the full extent of the study areas. Pages 1, 7, 8 and 9 now present an additional part of the settlement of Bunwell, parts of a number of Public Rights of Way (PRoW), part of a National Cycle Network route and part of an A road obtained from third parties. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.8.1 - Landscape and Visual - Zone of Theoretical Visibility (ZTV) of Proposed 400kV Overhead Line	Additional pages have been added to Revision B to present the full extent of the 3km study area and the 5km buffer included for context. Pages 1, 2, 8, 9 and 10 now present an additional part of the settlement of Bunwell, part of the Dedham Vale National Landscape (formerly Dedham Vale AONB) and woodland blocks (obtained from third parties). This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.8.2 - Landscape and Visual - Zone of Theoretical Visibility (ZTV) of Proposed 400kV Overhead Line	Additional pages have been added to Revision B to present the full extent of the 3km study area and the 5km buffer included for context. Pages 1, 7, 8 and 9 now present an additional part of the settlement of Bunwell, part of the Dedham Vale National Landscape (formerly Dedham Vale AONB) and woodland blocks (obtained from third parties). This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 13.8.6 - Landscape and Visual - ZTV of Cable Sealing End (CSE) Compound north of Dedham Vale National Landscape	Revision B has been re-scaled to present the full extent of the 3km study areas on page 1. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.

Volume	Figure	Correction
2	Figure 14.1 - Noise and Vibration - Baseline Noise Data	Revision B has been reorientated to present the full extent of the study area. Page 14 now presents an additional part of an outer limit noise contour associated with an existing road obtained from a third party. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 15.2 - Socio-economics, Recreation and Tourism - Business, Recreation and Tourism Assets	Revision B has been reorientated to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
2	Figure 17.2 - Cumulative Effects - Cumulative Short List of Other Developments	Additional pages have been added to Revision B to present the full extent of the study area. Pages 7 and 13 now present an additional part of the North Falls, Five Estuaries and Lower Thames Crossing Nationally Significant Infrastructure Projects. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.
3	Figure 2 - Flood Risk Areas *within Appendix - 12.2 - Flood Risk Assessment Screening*	Revision B has been reorientated to present the full extent of the study area. The areas contain no data associated with the proposals but have been included for completeness. This revision does not affect the preliminary assessment in the PEIR as the figures were not used to undertake the preliminary assessment.

Appendix I19

PEIR Errata Notifications

Appendix I19.1
Letter to Prescribed Consultees

FREEPOST N TO T

T: 0800 915 2497
email: contact@n-t.nationalgrid.com
www.nationalgrid.com/n-t

nationalgrid

June 2024

Dear Sir / Madam

Statutory Consultation for the project called Norwich to Tilbury: 12 noon on 10 April until 11:59pm on 26 July 2024

National Grid is consulting on our proposals to build approximately 184 km of new electricity transmission reinforcement in East Anglia between the existing substations at Norwich Main in Norfolk, Bramford in Suffolk, and Tilbury in Essex, as well as a new substation to connect new offshore wind generation on the Tendring peninsula. Statutory consultation is open until 11:59pm on 26 July 2024.

As you will be aware, as part of this statutory consultation we're also consulting on the preliminary findings from our environmental studies and assessments as well as proposed mitigation for any potential impacts to the local environment, including animal habitats and the local landscape.

Since publishing the Preliminary Environmental Information Report (PEIR) and supporting figures, we've identified some pages where the edges of maps have been clipped. This means there are some small geographical gaps between map sections This doesn't affect the information contained within the PEIR or our assessments to date, and we did not use these figures when carrying out our assessments. We are writing to you as a parish council potentially falling within those geographical areas and to let you know where you can review the updated pages.

While these areas are small, we've revised the relevant map sheets and have made these available on the Project document library on our website, accompanied by an errata document: .http://www.nationalgrid.com/n-t.

If you have any questions, please don't hesitate to contact us on 0800 915 2497.

With best wishes.

Yours sincerely

[redacted]

Project Director

Appendix I19.2
Letter to Impacted Communities

FREEPOST N TO T

T: 0800 915 2497
email: contact@n-t.nationalgrid.com
www.nationalgrid.com/n-t

26 June 2024

Dear Sir / Madam

Statutory Consultation for the project called Norwich to Tilbury: 12 noon on 10 April until 11:59pm on 26 July 2024

National Grid is consulting on our proposals to build approximately 184 km of new electricity transmission reinforcement in East Anglia between the existing substations at Norwich Main in Norfolk, Bramford in Suffolk, and Tilbury in Essex, as well as a new substation to connect new offshore wind generation on the Tendring peninsula. Please see our formal notifications, website and published material for a full description of our proposals and assessments.

Our proposals are part of The Great Grid Upgrade – the largest overhaul of the grid in generations. The Project will play a vital role in delivering electricity efficiently, reliably, and safely and will support the UK's move to reduce carbon emissions.

We wrote to you with news of our consultation in April and with an update that we were extending our consultation in early June.

As part of this statutory consultation, we're also consulting on the preliminary findings from our environmental studies and assessments as well as proposed mitigation for any potential impacts to the local environment, including animal habitats and the local landscape. Since publishing the Preliminary Environmental Information Report (PEIR) and supporting figures, we've identified some pages where the edges of maps have been clipped. This doesn't affect the information contained within the PEIR or our assessments to date, but it does mean there are some small geographical gaps between map sections. We are writing to you as a member of the community potentially falling within those geographical areas and to let you know where you can review the updated pages.

We've revised the relevant map sheets and have made these available on our website, accompanied by an errata document: http://www.nationalgrid.com/n-t.

To find out more about our proposals and why we need to build Norwich to Tilbury, please join us at one of our five remaining project webinars. These webinars are an opportunity for people to find out more from members of the project team and ask questions.

The dates and times of these sessions are shown below, and you can register to attend by signing up on ou [redacted]

Date and Time	Topic
Wednesday 10 July 2024: 6-7pm	Section A and B South Norfolk and Mid Suffolk
Thursday 11 July 2024: 6-7pm	Section C and D Babergh, Tendring and Colchester
Tuesday 16 July 2024: 6 -7pm	Section E and F – Braintree and Chelmsford
Wednesday 17 July 2024: 6-7pm	Section G and H Basildon, Brentwood and Thurrock
Thursday 18 July 2024: 6-7pm	Project Overview Two

Earlier this month we extended our consultation to allow people more time to provide feedback on our proposals after the General Election. Our consultation will remain open until **11:59pm on 26 July 2024.**

Any feedback you've previously submitted during this consultation remains valid, and if you want to provide any further comments you can do so. You can complete an online questionnaire via our website or return a printed copy of the Feedback questionnaire or a free text response via email: contact@n-t.nationalgrid.com or post: FREEPOST N TO T (please write this in capitals, you do not need a stamp).

Your feedback will help us further refine the project before we submit a Development Consent Order (DCO) application to the Planning Inspectorate.

If you have any questions, please don't hesitate to contact us on 0800 915 2497.
With best wishes.

Yours faithfully

[redacted]

Project Director

Appendix I20

List of Inspection Point Locations

Location	Address	Opening Times
Long Stratton Library	The Street, Long Stratton, NR15 2XJ	Monday – 8am to 11am Tuesday – 8am to 1pm Wednesday – 8am to 7pm Thursday – 8am to 1pm Friday – 8am to 7pm Saturday – 10 to 11am Sunday – 10am to 4pm
Tuckswood Library	Robin Hood Road, Eaton, NR4 6BX	Monday – 8am to 7pm Tuesday – 8am to 11am Wednesday – 8am to 7pm Thursday – 8am to 7pm Friday – 8am to 11am Saturday – 8am to 10am Sunday – 10am to 4pm
Stowmarket Library	Milton Road, Stowmarket, IP14 1EX	Monday – Closed Tuesday – 8:30am to 6:45pm Wednesday – 8:30am to 5:45pm Thursday – 8:30am to 5:45pm Friday – 8:30 to 6:30pm Saturday – 8:30 to 4pm Sunday – 10am to 4pm
Coggeshall Library	The Friends Meeting House, Stoneham Street, Coggeshall CO6 1UH	Monday – Closed Tuesday – 2pm to 5:30pm Wednesday – Closed Thursday – 9am to 5:30pm Friday – Closed Saturday – 9am to 5pm Sunday – Closed
Colchester Library	Trinity Square, Colchester CO1 1JB	Monday – 9am to 5:30pm Tuesday – 9am to 5:30pm Wednesday – 9am to 7pm Thursday – 9am to 5:30pm Friday – 9am to 5:30pm Saturday – 9am to 5pm Sunday – 1pm to 4pm
Greenstead Library	Hawthorn Avenue, Colchester CO4 3QE	Monday – 9am to 5:30pm Tuesday – 9am to 5:30pm Wednesday – Closed Thursday – 9am to 5:30pm Friday – Closed Saturday – 9am to 5pm Sunday – Closed
Prettygate Library	Prettygate Road, Colchester CO3 4EQ	Monday – Closed

Location	Address	Opening Times
		Tuesday – 9am to 7pm Wednesday – 9am to 5:30pm Thursday – Closed Friday – 9am to 5:30pm Saturday – 9am to 5pm Sunday – Closed
Manningtree Library	High Street, Manningtree, CO11 1AD	Monday – Closed Tuesday – 9am to 5:30pm Wednesday – 9am to 1pm Thursday – 1pm to 7pm Friday – 9am to 1pm Saturday – 9am to 5pm Sunday – Closed
Witham Library	18 Newland Street, Witham, CM8 2AQ	Monday – 9am to 5:30pm Tuesday – 9am to 5:30pm Wednesday – 9am to 7pm Thursday – 9am to 5:30pm Friday – 9am to 5:30pm Saturday – 9am to 5pm Sunday – Closed
Chadwell Library	Brentwood Road, Chadwell St Mary, RM16 4JP	Monday – 10am–5 pm Tuesday – 10am–5 pm Wednesday – Closed Thursday – 10am–5 pm Friday – 10am–5 pm Saturday – 10am–1 pm Sunday – Closed
Hatfield Peverel Library	The Street, Hatfield Peverel, CM3 2DP	Monday – 1pm to 6pm Tuesday – 10am to 6pm Wednesday – 10am to 6pm Thursday – Closed Friday – 10am to 7pm Saturday – 10am to 5pm Sunday – Closed
Brentwood Town Council	Council Offices, Ingrave Road, Brentwood, CM14 9SQ	Monday – 9am to 5:30pm Tuesday – 9am to 7pm Wednesday – 9am to 5:30pm Thursday – 9am to 5:30pm Friday – 9am to 5:30pm Saturday – 9am to 5pm Sunday – Closed
Norwich Library	Unit 3, The Forum Millenium Plain, Norwich, NR2 1AW	Monday to Friday – 8am to 10am Saturday – 9am to 5pm

Location	Address	Opening Times
		Sunday – 10.30am to 4.30pm
Diss Library	Church Street, Diss, IP22 4DD	Monday – 8am to 10am Tuesday – 8am to 7pm Wednesday – 8 to 10am Thursday – 8 to 10am Friday – 8am to 10am Saturday – 10am to 4pm Sunday – 10am to 4pm
Capel St Mary Library	Village Hall, The Street, Capel St. Mary IP9 2EF	Monday – Closed Tuesday – 9am to 12:30pm, 2pm to 5:30pm Wednesday – 9am to 12:30pm Thursday – 9am to 12:30pm Friday – 2pm to 5:30pm Saturday – 9am to 3pm Sunday – 10am to 3pm
Chelmsford Library	Market Road, Chelmsford CM1 1QH	Monday - 9am to 5:30pm Tuesday - 9am to 5:30pm Wednesday – 9am to 5:30pm Thursday – 9am to 7pm Friday – 9am to 5:30pm Saturday – 9am to 5pm Sunday – 10:30am to 1:30pm
Tilbury Library	Civic Square, Tilbury RM18 8AD	Monday – 10am to 1pm, 2pm to 5pm Tuesday – Closed Wednesday – 10am to 1pm, 2pm to 5pm Thursday – Closed Friday – Closed Saturday – Closed Sunday – Closed
Stanway Library	10, Villa Road, Stanway CO3 0RH	Monday – Closed Tuesday – 2pm to 7pm Wednesday – Closed Thursday – 9am to 1pm Friday – Closed Saturday – 9am to 5pm Sunday – Closed
Wivenhoe Library	104/6 High Street, Wivenhoe CO7 9AB	Monday – Closed Tuesday – 2pm to 7pm Wednesday – Closed Thursday – 9am to 5:30pm

Location	Address	Opening Times
		Friday – Closed Saturday – 9am to 5pm Sunday – Closed
Basildon Library	St Martin's Square, Basildon, SS14 1EE	Monday – 9am to 5pm Tuesday – 9am to 5pm Wednesday – 9am to 5pm Thursday – 9am to 5pm Friday – 9am to 5pm Saturday – 9am to 5pm Sunday – Closed
Brentwood Library	New Road, Brentwood, CM14 4BP	Monday – 9am to 5:30pm Tuesday – 9am to 7pm Wednesday – 9am to 5:30pm Thursday – 9am to 5:30pm Friday – 9am to 5:30pm Saturday – 9am to 5pm Sunday – Closed
Ingatestone Library	High Street, Ingatestone, CM4 9EU	Monday – 2pm to 7pm Tuesday – Closed Wednesday – 9am to 1pm Thursday – Closed Friday – Closed Saturday – 9am to 5pm Sunday – Closed
Writtle Library	45 The Green, Writtle, Chelmsford, CM1 3DT	Monday – 9am to 5pm* Tuesday – 9am to 1pm* Wednesday – 9am to 1pm Thursday – 2pm to 5:30pm Friday – 9am to 5pm* Saturday – 9am to 5pm Sunday – Closed
Ipswich Library	Northgate Street, Ipswich, IP1 3DE	Monday – 9am to 6pm Tuesday – 9am to 7pm Wednesday – 9am to 6pm Thursday – 9amto 6pm Friday – 9am to 7pm Saturday – 8:30am to 5pm Sunday – 10am to 4pm
East Tilbury Hub and Library	Princess Avenue, East Tilbury, Essex, RM18 8ST	Monday – Closed Tuesday – 10am to 5pm Wednesday – Closed Thursday – 10am to 5pm Friday – Closed

Location	Address	Opening Times
		Saturday – 10am to 1pm Sunday – Closed

Appendix I21

Hardcopy Materials in Inspection Points

Chadwell Library





East Tilbury Hub and Library





Tilbury Library





Basildon Centre





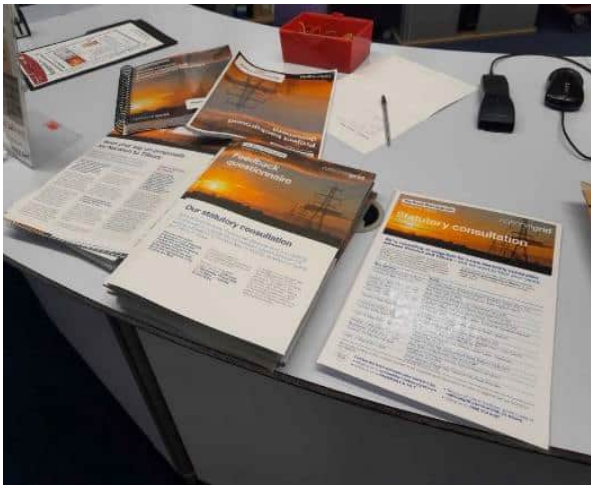
Brentwood Library





Chelmsford Central Library





Witham Library





Ingatestone Library





Diss Library





Norwich Library





Stowmarket Library





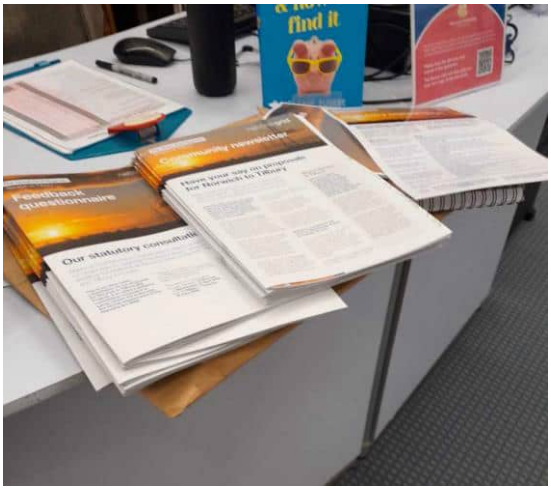
Capel St Mary Library





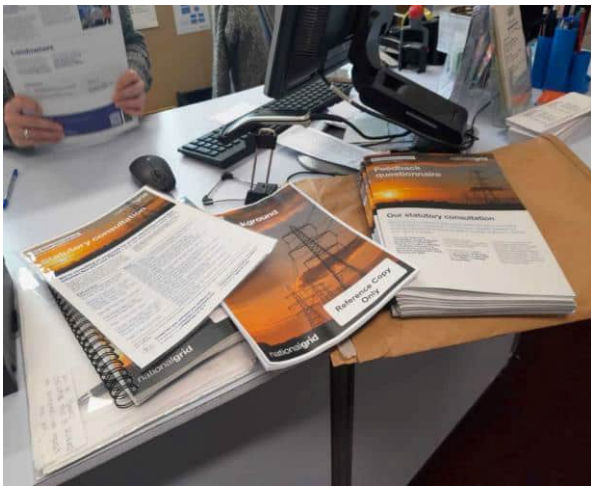
Manningtree Library





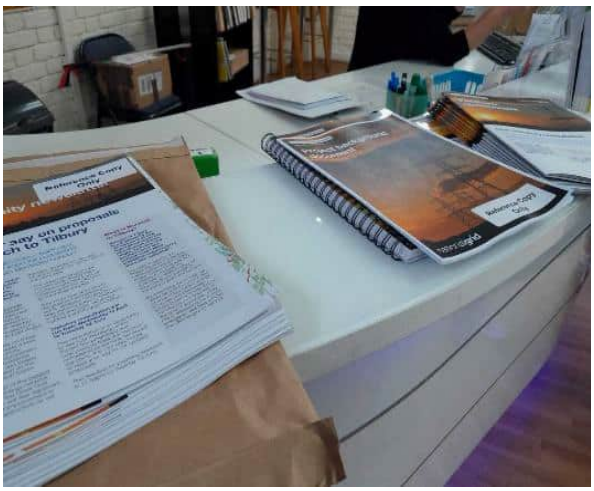
Greenstead Library





Colchester Library





Prettygate Library

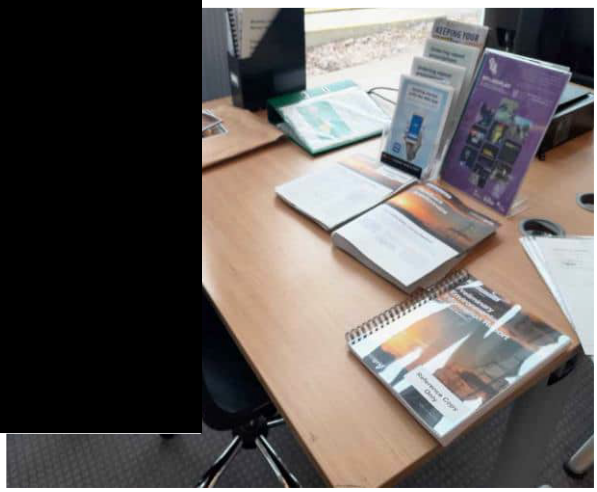




Wivenhoe Library



[redacted]



Stanway Library



[redacted]



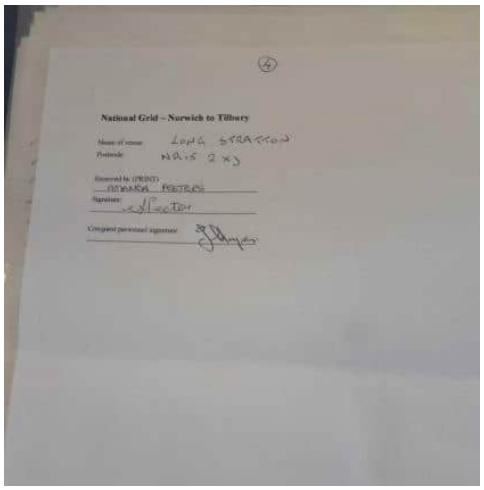
Coggeshall Library





Long Stratton Library





Tuckswood Library

No images available

Hatfield Peverel Library

No images available

Writtle Library

No images available

Brentwood Town Council

No images available

Ipswich Library

No images available

Appendix I22

The Holford and Horlock Rules

The Holford and Horlock Rules

1.1.1 In addition to the legislation and national policy context, National Grid employs two sets of rules/guidelines for the routeing and siting of new energy transmission infrastructure:

- the Holford Rules, which provide guidelines for the routeing of high voltage overhead transmission lines; and
- the Horlock Rules, which provide the approach to and guidelines for, the design and siting of substations (in addition to Cable Sealing End (CSE) compounds and line entries).

1.1.2 When considering new electricity infrastructure, National Grid has regard to the degree to which options comply with or deviate from these rules.

1.1.3 Paragraph 2.8.7 of the NPS EN-5 makes clear 'that the Holford Rules, and any updates, form the basis for the approach to routeing new overhead lines'. The Holford Rules state that routeing of high voltage overhead transmission lines should where possible, in summary:

- Rule 1: avoid areas of the highest amenity value and smaller areas of high amenity value;
- Rule 2: choose the most direct line with no sharp changes in direction;
- Rule 3: be positioned against tree and hill backgrounds as far as possible;
- Rule 4: prefer moderately open valleys with woods;
- Rule 5: be kept as far as possible from smaller lines, converging routes and other poles, masts, wires, and vales to avoid a concentration or 'wirescape'; and
- Rule 6: approach urban areas through industrial zones, where they exist; and when residential and recreational land intervenes between the approach line and the substation, carefully compare costs of undergrounding, for lines other than those of the highest voltage.

1.1.4 The Horlock Rules state that:

- Rule 1: in the development of system options including new substations consideration must be given to environmental issues from the earliest stage to balance the technical benefits and capital cost requirements, against the consequential environmental effects, in order to avoid as far as possible adverse effects;
- Rule 2: siting of substations, sealing end compounds and line entries should seek to avoid areas of the highest amenity, cultural or scientific value by the overall planning of the system connections and areas of local amenity value, important existing habitats and landscape features should be protected as far as reasonably practicable;
- Rule 3: siting of substations, extensions and associated proposals should take advantage of the screening provided by landform and existing features and the potential use of site layout and levels;
- Rule 4: proposals should keep visual, noise and other environmental effects to a minimum;

- Rule 5: land use effects of the proposal should be considered when planning the siting of substations or extensions;
- Rule 6: in design of new substations or line entries, early consideration should be given to the options available for terminal pylons, equipment, buildings and ancillary development appropriate to individual locations;
- Rule 7: space should be used effectively to limit the area required for development consistent with appropriate mitigation measures and to minimise the adverse effects on existing land use and rights of way, whilst also having regard to future extension of the substation;
- Rule 8: design of access roads, perimeter fencing, earth shaping, planting and ancillary development should form an integral part of the site layout and design to fit in with the surroundings;
- Rule 9: in open landscape especially, high voltage line entries should be kept, as far as possible, visually separate from low voltage lines and other overhead lines so as to avoid a confusing appearance; and
- Rule 10: the inter-relationship between pylons and substation structures and background and foreground features should be studied to reduce the prominence of structures from main viewpoints. Where practicable the exposure of terminal pylons on prominent ridges should be minimised by siting pylons against a background of trees rather than open skylines.

Appendix I23

Webinar material

I23.1 Norwich to Tilbury Project Overview One webinar



1

Agenda

01	Introduction and project background
02	Project overview and changes
03	Public statutory consultation
04	Q&A

2



3

The regional challenge

- Significant amount of energy generation above current capacity connecting in East Anglia
- The Climate Emergency – **net zero by 2050**
- Government's offshore wind ambition - **50 GW by 2030**
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- Such as:
  - Integrated offshore grid
  - Offshore cable – Norfolk to Essex
  - Onshore undergrounding

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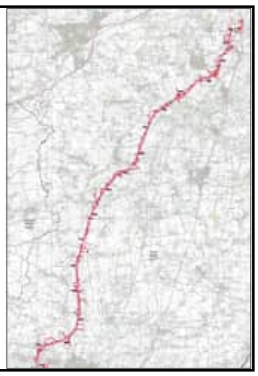




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- Considered both alignments with alternate battery storage position



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Waveney Valley

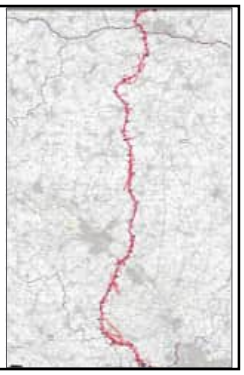
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- From the county boundary between South Norfolk and Mid Suffolk, the 2024 preferred draft alignment would run south, passing to the west of Mellis and to the east of Gislingham.
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East of Wortham near Brook Farm Airstrip

- Realignment to the east to support continued flight activity
- Changed routeing reduces overall effect on solar farm development
- Otherwise comparable effects albeit note that different receptors potentially affected



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North and west of Mellis Common

- Responding to heritage effects and landowner feedback
- Also lowers effects on views from the conservation area
- Overall magnitude of change and potential cumulative effects reduced by adopting 132kV alignment



16

South of Offton

- Extended removal of 132kV overhead line reduces potential cumulative effects. We are also removing two of the 132 kV to the south of Bramford Substation
- Realignment to reduce socio-economic effects
- Reduce effects on residential amenity



17

Section C – Babergh and Tendring

- From Bramford Substation, the preferred draft alignment would cross immediately into the district of Babergh. It would then run south-easterly to the northern side of Raydon Airfield.
- The proposal changes to underground cable past the east of Raydon and west of Holton St Mary as it enters the Dedham Vale National Landscape towards Tendring district and the site of the East Anglia Connection Node (EACN) substation near Ardleigh.
- We propose the use of trenchless installation techniques in a number of locations such as the R Stour and under the A12.



18

CSE to the North of the National Landscape

- Extends the cable length by around 1.5km
- Supports continued flight activity at Raydon airstrip
- Reduces heritage effects on cluster of heritage assets at Little Wenham
- CSE location benefits from enhanced screening rather than backclothing for views from the DVNL



19

EACN Access

Integrated proposal with North Falls & Five Estuaries

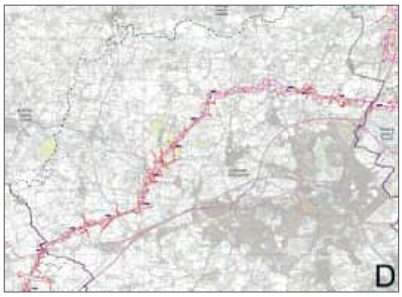
- All vehicles access via A120 onto a widened Bentley Road.
- Permanent private road to south of Little Bromley (construction HGV and AIL).
- Shared use of windfarm haul road for construction HGV when available.
- Considering offline non-motorised user provision during construction



20

Section D – Colchester

- From the EACN substation, an overhead line would head west, crossing past Ardleigh towards Great Horkesley.
- There is a section of cable where the draft alignment is close to the National Landscape (detail on the next slide)
- From here, the preferred draft alignment would continue southwest passing to the east of Fordham and Aldham and into the Braintree district near Surrex.



21

Cable near the National Landscape

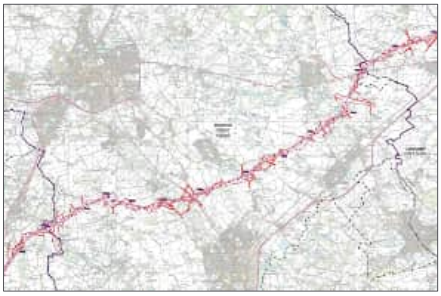
- Split corridor removed.
- Justification for cable remains, details for CSE locations and cable route unchanged.
- Narrowed corridor to reduce potential for loss of woodland.



22

Section E – Braintree

- After crossing into Braintree District, the preferred draft alignment would continue south-west, passing to the north of Witham and the south of Silver End before crossing the railway and heading south-west into Chelmsford district.



23

Fairstead CSE positioning

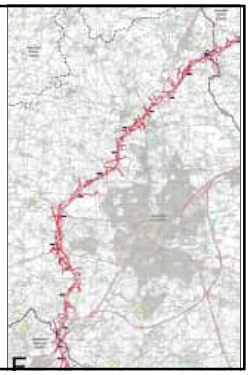
- Landowner feedback to reduce effects
- Allows shortening of cable route avoiding HDD under watercourse and willow stand
- Landscape screening building on existing vegetation
- Extended 132kV removal to reduce cumulative effects to the west of Fuller Street



24

Section F – Chelmsford

- The preferred draft alignment would enter the district from the north-east and run to the north of Chelmsford.
- It passes between Great Waltham and Little Waltham and then turns south to pass to the west of Writtle.
- There the draft alignment passes into Brentwood for a short distance and then back into Chelmsford to the east of Ingatestone.
- A number of localised changes to routeing and pylon positions are proposed responding to feedback



25

Section G – Basildon and Brentwood

- Passing to the north and east of Ingatestone, the preferred draft alignment would cross the A12 and the railway in the north of the Brentwood district.
- The route would then travel directly south, crossing briefly into Chelmsford and then following the boundary between the Basildon and Brentwood districts.
- Passing to the east of Brentwood and the west of Billericay, the alignment would continue south, crossing the A127 and railway on the border of Thurrock District.



26

Dunton Hills

- From TB216 a proposed change to the west to follow a gas pipeline corridor between various proposed housing developments. This is expected to avoid a reduction in the potential housing though some effects on a solar farm may be unavoidable.
- A section of the existing 132kV overhead line to be replaced by cable, though details subject to ongoing discussion with UK Power Networks



27

Section H – Thurrock

- The preferred draft alignment would continue south, passing to the east of Thurrock airfield and to the west of Horndon on the Hill. The overhead line would then head east, before going south to cross the A13 to the north-east of Southfields.
- The underground cable alignment is then proposed from the south of Orsett golf course through to new equipment constructed within the existing Tilbury Substation.
- National Grid is actively engaged in developing a scheme that co-exists with a range of development and environmental proposals in this area.



28



29

Timing and duration

- Our public consultation began on **10 April** and closes on **18 June 2024**, lasting ten weeks.



30

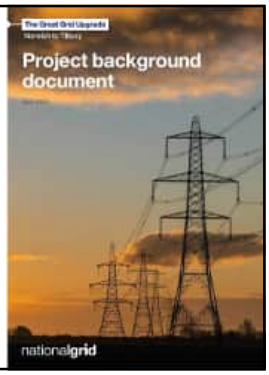
Key materials

[redacted]:

ap

- FAQs
- Online feedback questionnaire

- **Technical and supporting documents, including:**
  - 2024 Design Development Report
  - 2024 Strategic Options Backcheck and Review
  - Preliminary Environmental Information Report (PEIR)
  - 2023 Non-Statutory Consultation Feedback Report
- **Non-technical documents, including:**
  - 2024 Project Background Document
  - Non Technical Summary of the PEIR
  - Community Newsletter
  - Feedback questionnaire
  - Consultation panels
- Project maps and plans
- Statement of Community Consultation (SoCC)



31

Public information events

Venue	Local authority	Venue	Local authority
Towngate Theatre, Basildon Wednesday 24 April: 12 – 5pm	Basildon	The Civic Hall, Grays Wednesday 8 May: 2 – 7pm	Thurrock
The Brentwood Centre, Brentwood Thursday 25 April: 2 – 7pm	Brentwood	Thorpe Hall, Ashwellthorpe Thursday 9 May 1 – 6pm	South Norfolk
Chelmsford City Racecourse, Chelmsford Saturday 27 April: 11am – 4pm	Chelmsford	Tibenham Community Hall, Tibenham Friday 10 May: 1 – 6pm	South Norfolk
Gislingham Village Hall, Gislingham Tuesday 30 April: 12 – 5pm	Mid Suffolk	Witham Public Hall, Witham Tuesday 14 May: 11am – 4pm	Braintree
Copdock Village Hall, Copdock Wednesday 1 May: 11am – 4pm	Babergh	Diss Town Football Club, Diss Wednesday 15 May: 1 – 6pm	South Norfolk
Needham Market Community Centre, Needham Market Friday 3 May: 1 – 6pm	Mid Suffolk	Langham Community Centre, Langham Thursday 16 May: 2 – 7pm	Colchester
Lawford Venture Centre 2000, Manningtree Saturday 4 May: 11am – 4pm	Tendring	Great Bromley Village Hall, Great Bromley Friday 17 May: 1 – 6pm	Tendring

32

Webinar events

Date	Time
Wednesday 17 April: Project Overview One	6-7pm
Wednesday 29 May: Section A and B – South Norfolk and Mid Suffolk	6-7pm
Thursday 30 May: Section C and D – Babergh, Tendring and Colchester	6-7pm
Wednesday 5 June: Section E and F – Braintree and Chelmsford	6-7pm
Thursday 6 June: Section G and H – Basildon, Brentwood and Thurrock	6-7pm
Wednesday 12 June: Project Overview Two	6-7pm

33

How to respond to our consultation

- There are a range of ways to provide feedback:
  - **Website**: www.nationalgrid.com/norwich-to-tilbury
  - **Email**: contact@n-t.nationalgrid.com
  - **Freepost:** FREEPOST N TO T
- feedback forms are available:
  - online
  - at inspection points
  - at public information events
  - on request
  - We also have a freephone hotline: 0800 915 2497

34



35



36

I23.2 Section A and B South Norfolk and Mid Suffolk webinar



1

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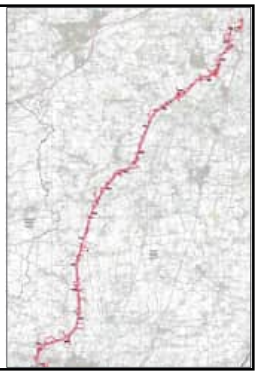




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South of Norwich Main Substation

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Alignment changes

- RG013 to RG016 – reposition to respond to archaeology findings and then realign to avoid solar panels
- RG028 to RG037 – slight realignment to respond to landowner feedback and increase separation to South Norfolk Model Flying Club



13

Alignment changes

- RG043 to RG044 – pylon moves to move out of or to edge of views
- RG046 to RG050 – Reduce ecology effects
- RG070 to RG074 – Reduce effects on residential amenity







14

Waveney Valley

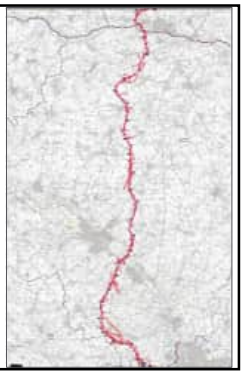
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- Extended undergrounding of 132kV overhead line reduces potential cumulative effects. We are also undergrounding two of the 132 kV to the south of Bramford Substation.
- Realignment to reduce socio-economic effects
- Reduce effects on residential amenity



19



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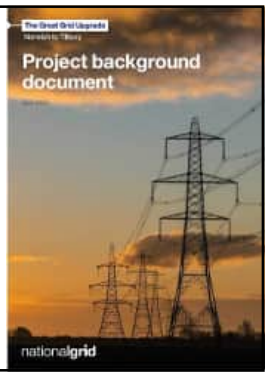
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27



28

I23.3 Section C and D Babergh, Tendring and Colchester webinar



1

Agenda

01	Introduction and project background
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2



3

The regional challenge

- Significant amount of energy generation above current capacity connecting in East Anglia
- The Climate Emergency – **net zero by 2050**
- Government's offshore wind ambition - **50 GW by 2030**
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- Continue to publish Project updates



6

Alternatives

- Such as:
  - Integrated offshore grid
  - Offshore cable – Norfolk to Essex
  - Onshore undergrounding

7

OCSS and ESO East Anglia Network Study

- In March 2024, ESO carried out a study to look at the consequential infrastructure impacts should the Government decide to take the OCSS forward which set out its assessment of drivers for network reinforcement in East Anglia and the OCSS study.
- The study states 'there is no single option that minimises impacts across all the metrics' and does not put forward an option for an offshore ring main on viability grounds.
- The report confirms that the OHL option is the most efficient and economical and is the only one that can be delivered in 2030.
- We have reviewed the outcomes as part of our ongoing assessment [redacted] Tilbury, and this report is
- We are required to continue to meet our licence obligations and progress the Project.



8



9

Maps and plans

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10

Section C – Babergh and Tendring

- From Bramford Substation, the preferred draft alignment would cross immediately into the district of Babergh. It would then run south-easterly to the northern side of Raydon Airfield.
- The proposal changes to underground cable past the east of Raydon and west of Holton St Mary as it enters the Dedham Vale National Landscape towards Tendring district and the site of the East Anglia Connection Node (EACN) substation near Ardleigh.
- We propose the use of trenchless installation techniques in a number of locations such as the R Stour and under the A12.



11

132kV removal & Fisheries avoided South of Bramford

- Extended removal of both 132kV overhead line reduces potential cumulative effects
- JC010 to JC016 realignment to avoid oversail of fisheries lakes which would otherwise require closure for safety reasons. Change reduces socio-economic effects
- Reduce effects on residential amenity



12

CSE to the North of the National Landscape

- Extends the cable length by around 1.5km
- Supports continued flight activity at Raydon airstrip
- Reduces heritage effects on cluster of heritage assets at Little Wenham
- CSE location benefits from enhanced screening rather than backclothing for views from the DVNL



13

Notley to Higham

- Narrowed corridor in places to avoid various features (properties, woodland, veteran trees)
- Order limit extent inclusive of requirement for flexibility ahead of detailed design – works not generally across whole width
- Temporary attenuation ponds at regular intervals – siting informed by terrain and potential outfalls



14

Higham to Langham

Various trenchless cable sections

River Stour – to avoid the greater ecology / navigation interests of the river channel.

Langham Church – to avoid woodland removal within DVNL adjacent to grade I heritage asset.

Split corridor still potentially required but may be able to use west only if potential Source Protection Zone effects can be avoided / mitigated.



15

Langham and A12

- Narrowed corridor due to property proximity.
- Insufficient space at Black Brook crossing for trenchless techniques - some tree loss unavoidable.
- Trenchless under the A12
- As previously advised cable continues through to the EACN substation.



16

EACN Access

Integrated proposal with North Falls & Five Estuaries

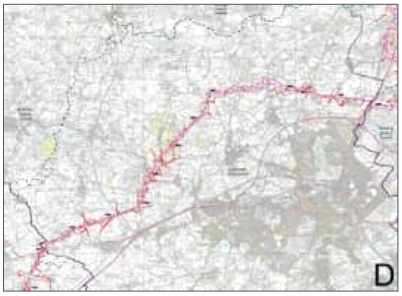
- All vehicles access via A120 onto a widened Bentley Road.
- Permanent private road to south of Little Bromley (construction HGV and AIL).
- Shared use of windfarm haul road for construction HGV when available.
- Considering offline non-motorised user provision during construction



17

Section D – Colchester

- From the EACN substation, an overhead line would head west, crossing past Ardleigh towards Great Horkesley.
- There is a section of cable where the draft alignment is close to the National Landscape (detail on the next slide)
- From here, the preferred draft alignment would continue southwest passing to the east of Fordham and Aldham and into the Braintree district near Surrex.



18

Great Horkesley

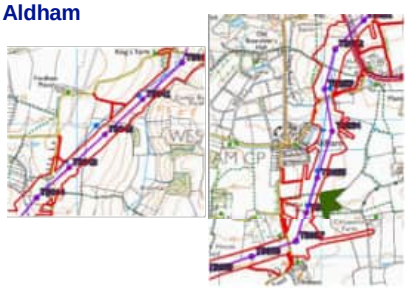
- Split corridor removed.
- Justification for cable remains, details for CSE locations and cable route unchanged.
- Narrowed corridor to reduce potential for loss of woodland.



19

Changes through to Aldham

- TB040 to TB044 – responding to planning application and approval of a farm reservoir.
- TB052 to TB057 – realignment to seek to increase separation to the extent possible.



20

West of Marks Tey

- TB066 to TB076 interlinked change responding to landowner requests for repositioning, avoidance of fishing lake to south.



21



22

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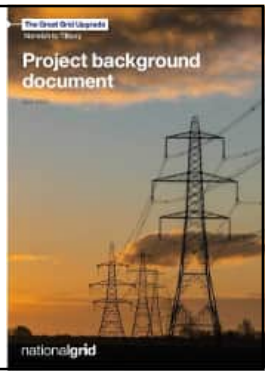
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29



30

I23.4 Section E and F Braintree and Chelmsford webinar



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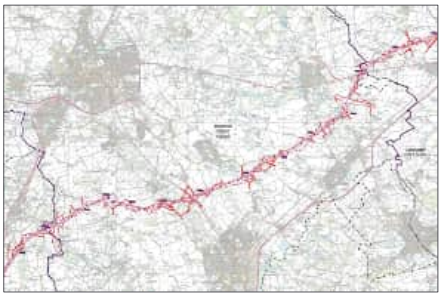




9

Section E – Braintree

- After crossing into Braintree District, the preferred draft alignment would continue south-west, passing to the north of Witham and the south of Silver End before crossing the railway and heading south-west into Chelmsford district.



10

Coggeshall

- 33kV overhead removal extended to reduce cumulative effects.
- Interlinked changes to respond to landowner feedback and avoid oversail of fishing lake, avoiding restrictions for safety reasons.



11

Bradwell Quarry – Monks Farm

An evolving situation:

- Essex minerals plan consultation ongoing.
- Change to purple responding to feedback given lack of planning status.
- Retained wider order limits to respond to evolving minerals plan response.
- Co-existence possible with pylons located to very edge of sites.



12

Rivenhall

- Realignment to reduce effects on residential amenity tied in with responding to landowner feedback.
- Attention to construction access routeing to reduce socio-economic effects.
- Oversails now consented Innova solar farm but pylons outside panel area.



13

Fairstead CSE positioning

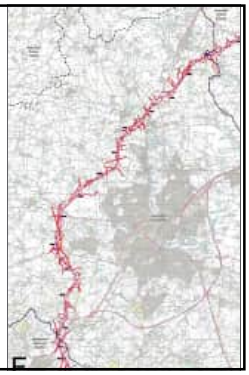
- Landowner feedback to reduce effects.
- Allows shortening of cable route avoiding HDD under watercourse and willow stand.
- Landscape screening building on existing vegetation.
- Extended 132kV removal to reduce cumulative effects to the west of Fuller Street.



14

Section F – Chelmsford

- The preferred draft alignment would enter the district from the north-east and run to the north of Chelmsford.
- It passes between Great Waltham and Little Waltham and then turns south to pass to the west of Writtle.
- There the draft alignment passes into Brentwood for a short distance and then back into Chelmsford to the east of Ingatestone.
- A number of localised changes to routeing and pylon positions are proposed responding to feedback



15

Existing 132kV overhead line replaced by underground cable

- Extended 132kV removal to reduce cumulative effects.



16

Chelmsford Northern Relief Road

- Essex minerals plan consultation ongoing - potential change north of TB131.
- Revised crossing arrangement adjacent to CNRR to reduce effects on residential views.



17

Bushy Wood

- Straighten alignment to increase separation to homes.
- Alternatives north of Bushy Wood much closer to homes.



18

Roxwell Road and East of Ingatestone

- Small adjustments to respond to landowner feedback and to seek reduce visual effects.
- Move reduces oversail of animal rescue centre and moves a pylon outside flood zone.





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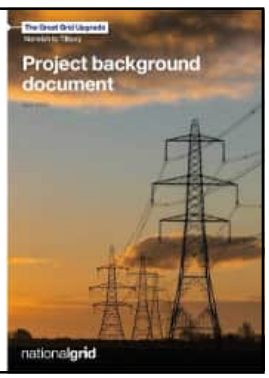
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I23.5 Section G and H Basildon, Brentwood and Thurrock webinar



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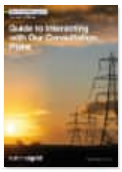
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Section G – Basildon and Brentwood

- Passing to the north and east of Ingatestone, the preferred draft alignment would cross the A12 and the railway in the north of the Brentwood district.
- The route would then travel directly south, crossing briefly into Chelmsford and then following the boundary between the Basildon and Brentwood districts.
- Passing to the east of Brentwood and the west of Billericay, the alignment would continue south, crossing the A127 and railway on the border of Thurrock District.



10

East of Ingatestone

- Move reduces oversail of animal rescue centre and moves a pylon outside of the flood zone.



11

North of Blind Lane

- Readjustment to move the angle pylon further north from residential properties.



12

Dunton Hills

- From TB216 a proposed change to the west to follow a gas pipeline corridor between various proposed housing developments. This is expected to avoid a reduction in the potential housing though some effects on a solar farm may be unavoidable.
- A section of the existing 132kV overhead line to be replaced by cable, though details subject to ongoing discussion with UK Power Networks.



13

Section H – Thurrock

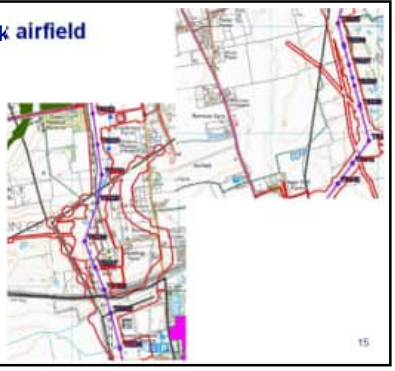
- The preferred draft alignment would continue south, passing to the east of Thurrock airfield and to the west of Horndon on the Hill. The overhead line would then head east, before going south to cross the A13 to the north-east of Southfields.
- The underground cable alignment is then proposed from the south of Orsett golf course through to new equipment constructed within the existing Tilbury Substation.
- National Grid is actively engaged in developing a scheme that co-exists with a range of development and environmental proposals in this area.



14

132kV cable & Thurrock airfield

- DHGV 132kV cable provisional arrangements but ongoing discussion with UKPN.
- Thurrock airstrip – additional pylon allows heights to be reduced.



15

Entry to Tilbury Substation

- Many competing interests – SSSI, PofT, Freeport.
- No change to alignment to date but further detail added.



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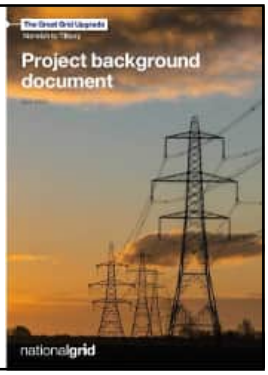
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Date	Time
Wednesday 17 April: Project Overview One	6-7pm
Wednesday 10 July: Section A and B – South Norfolk and Mid Suffolk	6-7pm
Thursday 11 July: Section C and D – Babergh, Tendring and Colchester	6-7pm
Tuesday 16 July: Section E and F – Braintree and Chelmsford	6-7pm
Wednesday 17 July: Section G and H – Basildon, Brentwood and Thurrock	6-7pm
Thursday 18 July: Project Overview Two	6-7pm

20

Key materials

[redacted]ap
  - FAQs
  - Online feedback questionnaire
- **Technical and supporting documents, including:**
  - 2024 Design Development Report
  - 2024 Strategic Options Backcheck and Review
  - Preliminary Environmental Information Report (PEIR)
  - 2023 Non-Statutory Consultation Feedback Report
- **Non-technical documents, including:**
  - 2024 Project Background Document
  - Non Technical Summary of the PEIR
  - Community Newsletter
  - Feedback questionnaire
  - Consultation panels
- Project maps and plans
- Statement of Community Consultation (SoCC)



21

Keeping you informed

Throughout the consultation and the project development process we will issue updates including:

- **Regular E-project updates**
  - May 2024
  - June 2024
- **Website updates**
- **Emails, letters and postcards to PCZ at key project milestones**



22

How to respond to our consultation

- There are a range of ways to provide feedback:
  - **Website**: www.nationalgrid.com/norwich-to-tilbury
  - **Email**: contact@n-t.nationalgrid.com
  - **Freepost:** FREEPOST N TO T
- feedback questionnaires are available:
  - online
  - at inspection points
  - on request
  - We also have a freephone hotline: 0800 915 2497

23



24


Thank you
The Great Grid Upgrade
nationalgrid

I23.6 Norwich to Tilbury Project Overview Two webinar



1

Agenda

01	Introduction and project background
02	Project overview and changes
03	Public statutory consultation
04	Q&A

2



3

The regional challenge

- Significant amount of energy generation above current capacity connecting in East Anglia
- The Climate Emergency – **net zero by 2050**
- Government's offshore wind ambition - **50 GW by 2030**
- Offshore wind connection points and network reinforcements are required up and down the East Coast.



4

The Great Grid Upgrade

Norwich to Tilbury is part of The Great Grid Upgrade – the largest overhaul of the electricity grid in generations, and covering the development of 17 projects.

The Great Grid Upgrade will play a big part in the UK government's plan to boost homegrown power.

It will help the UK switch to clean energy, by enabling the connection of more renewable and low carbon electricity and will create long lasting benefits to households and businesses across the UK.



5

Activity following the 2023 consultation

- Reviewed and considered feedback and further developed our design taking this into account
- Continued liaising with landowners along the route for access to surveys and to seek voluntary agreements.
- Continued our environmental surveys and technical appraisals to inform design and the Preliminary Environmental Information Report (PEIR)
- Continued to engage with stakeholders and elected representatives, including local authorities, environmental bodies and MPs across the Project area
- Continue to publish Project updates



6

Alternatives

We've received a lot of consultation feedback on alternative technology solutions, such as:

- Integrated offshore grid
- Offshore cable - Norfolk to Essex
- Onshore undergrounding (AC and HVDC)

ESO published their Independent Study on 12 March



7



8

Maps and plans

- We're presenting a range of information at statutory consultation, including detailed maps and plans.
- We've produced a Guide to Interacting with our Consultation Plans to help people navigate the information available on our website.
- The draft order limits show areas within which work may occur – such as construction laydown and vehicle movements – but not all the land shown will be affected.
- We've produced an interactive Project map to help people understand the proposals.
- I will now run through the preferred draft alignment and the main changes made following the 2023 non-statutory consultation.
- Further detail on these and other changes in the Design Development Report.



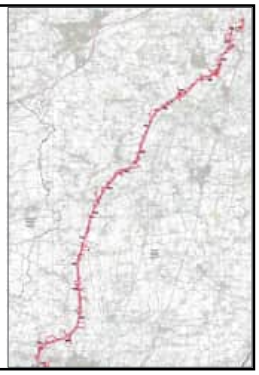




9

Section A – South Norfolk

- We are proposing to build an overhead line heading south out of Norwich Main Substation (the start point of Norwich to Tilbury), and running to the east of Mulbarton, Tacolneston and Shelfanger and then to the west of Roydon on the Mid Suffolk border.



10

South of Norwich Main Substation

- Battery Storage Proposals progressing through planning
- Considered both alignments with alternate battery storage position



11

Waveney Valley

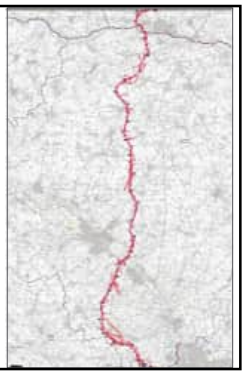
- Partly within Section A and B
- Responding to combination of landscape, heritage and recreational effects but mindful of the effects arising from undergrounding
- Liaising with Suffolk Wildlife Trust about co-existing with Landscape Recovery Project
- Consulting on overhead line baseline and the alternative to inform decision making



12

Section B – Mid Suffolk

- From the county boundary between South Norfolk and Mid Suffolk, the 2024 preferred draft alignment would run south, passing to the west of Mellis and to the east of Gislingham.
- It would then continue south past Stowupland and Needham Market, before crossing back over the railway and turning eastwards at Offton, running north of Flowton and connecting into Bramford Substation.
- From here, the overhead line would run south-east for a short distance to the border with Babergh district.



13

East of Wortham near Brook Farm Airstrip

- Realignment to the east to support continued flight activity
- Changed routeing reduces overall effect on solar farm development
- Otherwise comparable effects albeit note that different receptors potentially affected



14

North and west of Mellis Common

- Responding to heritage effects and landowner feedback
- Also lowers effects on views from the conservation area
- Overall magnitude of change and potential cumulative effects reduced by adopting 132kV alignment



15

South of Offton

- Extended removal of 132kV overhead line reduces potential cumulative effects. We are also removing two of the 132 kV to the south of Bramford Substation
- Realignment to reduce socio-economic effects
- Reduce effects on residential amenity



16

Section C – Babergh and Tendring

- From Bramford Substation, the preferred draft alignment would cross immediately into the district of Babergh. It would then run south-easterly to the northern side of Raydon Airfield.
- The proposal changes to underground cable past the east of Raydon and west of Holton St Mary as it enters the Dedham Vale National Landscape towards Tendring district and the site of the East Anglia Connection Node (EACN) substation near Ardleigh.
- We propose the use of trenchless installation techniques in a number of locations such as the R Stour and under the A12.



17

CSE to the North of the National Landscape

- Extends the cable length by around 1.5km
- Supports continued flight activity at Raydon airstrip
- Reduces heritage effects on cluster of heritage assets at Little Wenham
- CSE location benefits from enhanced screening rather than backclothing for views from the DVNL



18

EACN Access

Integrated proposal with North Falls & Five Estuaries

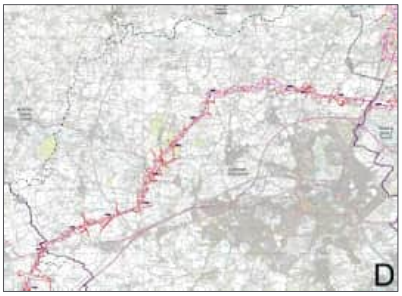
- All vehicles access via A120 onto a widened Bentley Road.
- Permanent private road to south of Little Bromley (construction HGV and AIL).
- Shared use of windfarm haul road for construction HGV when available.
- Considering offline non-motorised user provision during construction



19

Section D – Colchester

- From the EACN substation, an overhead line would head west, crossing past Ardleigh towards Great Horkesley.
- There is a section of cable where the draft alignment is close to the National Landscape (detail on the next slide)
- From here, the preferred draft alignment would continue southwest passing to the east of Fordham and Aldham and into the Braintree district near Surrex.



20

Cable near the National Landscape

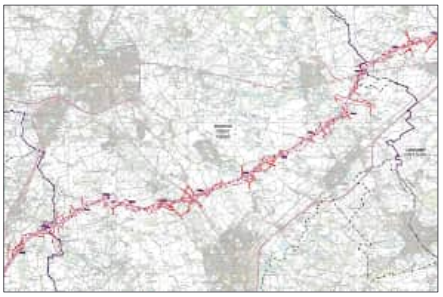
- Split corridor removed.
- Justification for cable remains, details for CSE locations and cable route unchanged.
- Narrowed corridor to reduce potential for loss of woodland.



21

Section E – Braintree

- After crossing into Braintree District, the preferred draft alignment would continue south-west, passing to the north of Witham and the south of Silver End before crossing the railway and heading south-west into Chelmsford district.



22

Fairstead CSE positioning

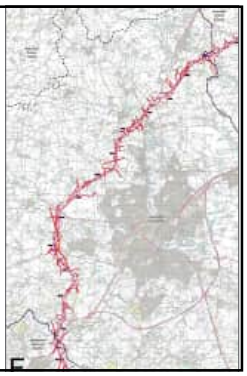
- Landowner feedback to reduce effects
- Allows shortening of cable route avoiding HDD under watercourse and willow stand
- Landscape screening building on existing vegetation
- Extended 132kV removal to reduce cumulative effects to the west of Fuller Street



23

Section F – Chelmsford

- The preferred draft alignment would enter the district from the north-east and run to the north of Chelmsford.
- It passes between Great Waltham and Little Waltham and then turns south to pass to the west of Writtle.
- There the draft alignment passes into Brentwood for a short distance and then back into Chelmsford to the east of Ingatestone.
- A number of localised changes to routeing and pylon positions are proposed responding to feedback



24

Section G – Basildon and Brentwood

- Passing to the north and east of Ingatestone, the preferred draft alignment would cross the A12 and the railway in the north of the Brentwood district.
- The route would then travel directly south, crossing briefly into Chelmsford and then following the boundary between the Basildon and Brentwood districts.
- Passing to the east of Brentwood and the west of Billericay, the alignment would continue south, crossing the A127 and railway on the border of Thurrock District.



25

Dunton Hills

- From TB216 a proposed change to the west to follow a gas pipeline corridor between various proposed housing developments. This is expected to avoid a reduction in the potential housing though some effects on a solar farm may be unavoidable.
- A section of the existing 132kV overhead line to be replaced by cable, though details subject to ongoing discussion with UK Power Networks



26

Section H – Thurrock

- The preferred draft alignment would continue south, passing to the east of Thurrock airfield and to the west of Horndon on the Hill. The overhead line would then head east, before going south to cross the A13 to the north-east of Southfields.
- The underground cable alignment is then proposed from the south of Orsett golf course through to new equipment constructed within the existing Tilbury Substation.
- National Grid is actively engaged in developing a scheme that co-exists with a range of development and environmental proposals in this area.



27



28

Statutory consultation

- Following the announcement of the General Election, we have extended our public consultation until **11:59pm on Friday 26 July.**
- We have held 19 events so far, including 14 public information events and five webinars.
- Engagement with stakeholders and elected representatives, including local authorities, environmental bodies and MPs across the Project area.



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Public information events

Venue	Local authority	Venue	Local authority
Towngate Theatre, Basildon Wednesday 24 April: 12 – 5pm	Basildon	The Civic Hall, Grays Wednesday 8 May: 2 – 7pm	Thurrock
The Brentwood Centre, Brentwood Thursday 25 April: 2 – 7pm	Brentwood	Thorpe Hall, Ashwellthorpe Thursday 9 May 1 – 6pm	South Norfolk
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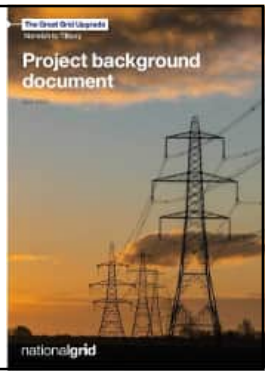
30

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Date	Time
Wednesday 17 April: Project Overview One	6-7pm
Wednesday 29 May: Section A and B – South Norfolk and Mid Suffolk	**6-7pm**
Thursday 30 May: Section C and D – Babergh, Tendring and Colchester	**6-7pm**
Wednesday 5 June: Section E and F – Braintree and Chelmsford	**6-7pm**
Thursday 6 June: Section G and H – Basildon, Brentwood and Thurrock	**6-7pm**
Wednesday 12 June: Project Overview Two	6-7pm

Key materials

- **[redacted]luding:**
  - [redacted]ctive map
  - FAQs
  - Online feedback questionnaire
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  - **Email**: contact@n-t.nationalgrid.com
  - **Freepost:** FREEPOST N TO T
- feedback forms are available:
  - online
  - at inspection points
  - at public information events
  - on request
  - We also have a freephone hotline: 0800 915 2497





Appendix I24

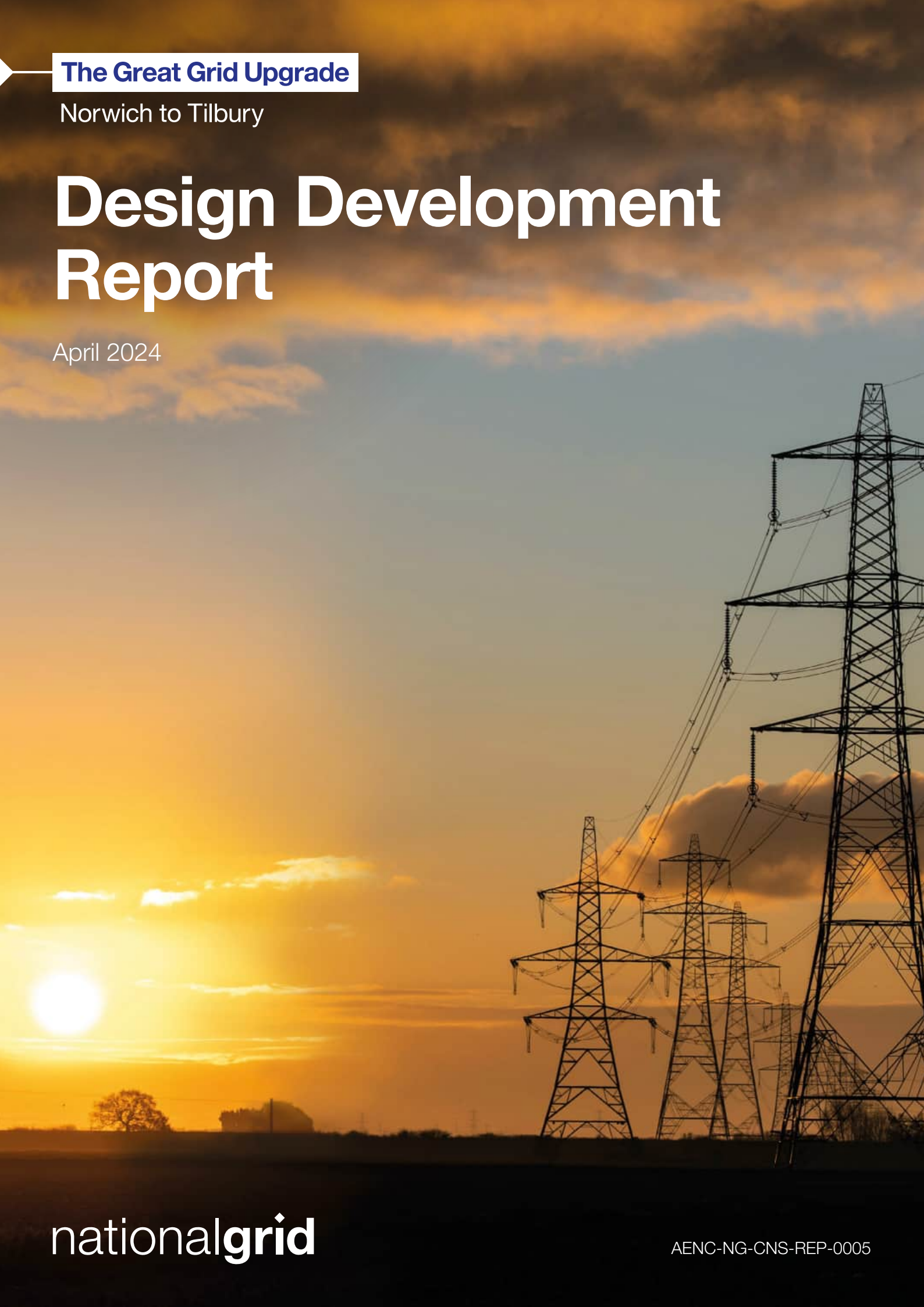
Design Development Report
(and Appendix)

The Great Grid Upgrade

Norwich to Tilbury

Design Development Report

April 2024



nationalgrid

AENC-NG-CNS-REP-0005

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Abbreviations

AC	Alternating Current
AONB	Area of Outstanding Natural Beauty
CDM	Construction (Design and Management) Regulations (CDM)
CPRSS	Corridor Preliminary Routeing and Siting Study
CRoW	Countryside and Right of Way Act
CSE	Cable Sealing End
CWS	County Wildlife Site
DCO	Development Consent Order
DNO	Distribution Network Operators
EACN	East Anglia Connection Node
EIA	Environmental Impact Assessment
EMF	Electric and Magnetic fields
ESO	Electricity System Operator
EWP	Energy White Paper
FES	Future Energy Scenarios
GIL	Gas Insulated Line
GW	Gigawatt
HDD	Horizontal Directional Drilling
HVDC	High Voltage Direct Current
kV	Kilovolt
km	Kilometre
LTC	Lower Thames Crossing
LWS	Local Wildlife Site
MEWP	Mobile Elevated Working Platform
MITS	Main Interconnected Transmission System
NEA	North East Anglia
NETS	National Electricity Transmission System
NETS SQSS	National Electricity Transmission System Security and Quality of Supply Standard
NGC	National Grid Company
NGET	National Grid Electricity Transmission
NOA	Network Options Assessment
NPS	National Policy Statement

NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
OCSS	Offshore Co-ordination Support Scheme
OFFSET	Offshore Electricity Grid Task Force
OTNR	Offshore Transmission Network Review
OHL	Overhead Lines
PRoW	Public Right of Way
SAC	Special Area of Conservation
SEA	South East Anglia
SOBR	Strategic Options Backcheck and Review
SQSS	Security and Quality of Supply Standard
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
WHS	World Heritage Site
µT	Microteslas

Executive summary

National Grid Electricity Transmission plc (NGET) referred to as National Grid in this report is developing proposals to reinforce the high voltage power network in East Anglia. It is National Grid that is developing plans for Norwich to Tilbury (the 'Project'). The Project would support the UK's net zero target through the connection in East Anglia of new low carbon energy generation, and by reinforcing the transmission network.

In spring 2022, a non-statutory public consultation was held for a period of eight weeks, between April 2022 and June 2022. This consultation introduced the Project, explained how National Grid had developed its proposals, and sought the views of the public and stakeholders.

In summer 2023, an additional non-statutory public consultation was held for a period of eight weeks, between June 2023 and August 2023. The 2023 non-statutory consultation presented a preferred draft alignment which showed potential positions for overhead line and associated pylons, centreline for the underground cable sections, Cable Sealing End (CSE) compounds and connection substations. Changes to the proposed plans, both inside and outside of the 2022 preferred draft corridor were presented as part of this.

The feedback received during the 2022 and 2023 non-statutory consultations has been carefully reviewed and considered, alongside the findings of environmental and engineering studies. We have also backchecked and reviewed previous studies.

This report presents the changes that have been made to the Project since the 2023 non-statutory consultation.

In summary, the areas where the most extensive changes to the 2023 preferred draft alignment have been made) are:

- south of Norwich Main Substation between RG01 and RG07;
- around 2 km in the Waveney Valley between approximately RG84 and RG90 (potential for the use of underground cable on a slightly modified alignment referred to as the Waveney Valley Alternative);
- east of Wortham near Brook Farm Airstrip between RG90 and RG100;
- north and west of Mellis Common between RG103 and RG116;
- south of Offton between RG191 to RG200;
- to the north of Dedham Vale National Landscape (an Area of Outstanding Natural Beauty (AONB)) between approximately JC26 to JC34, moving the CSE compound to the north of Raydon airstrip;
- moving the western CSE compound at Fairstead to the east; and
- adoption of the existing gas pipeline corridor at Dunton Hills for the overhead line alignment.

This report also describes, for these areas, the alternatives that have been considered and the reasons why they were less preferred.

No final decision as to the means of reinforcement has been made and any relevant decision to be made following consideration of the feedback to the 2024 statutory consultation and will be

the subject of reconsideration and backchecking throughout the process of developing the Project.

Our current draft proposals for the Project (referred to as the 2024 preferred draft alignment) as presently indicated and which are the subject of the statutory consultation comprise:

- a new 400 kV electricity transmission connection of approximately 184 km overall length from Norwich Main Substation to Tilbury Substation via Bramford Substation comprising:
    - approximately 159 km of new overhead line supported on approximately 510 steel lattice pylons (approximately 50 m in height) some of which are gantries (typically up to 15m in height) within proposed CSE compounds, or existing or proposed substations; and
    - approximately 25 km of 400 kV underground cabling (some of which is located through the Dedham Vale National Landscape (an AONB).
- six new CSE compounds, each with a permanent access, to connect the overhead lines to the underground cables;
- a new 400 kV East Anglia Connection Node (EACN) substation, with a new permanent access, on the Tendring Peninsula. This is proposed to be an Air Insulated Switchgear (AIS) substation;
- substation extension works at the existing Norwich Main, and Bramford substations and works within the existing Tilbury Substation to connect and support operation of the new transmission connection; and
- temporary works associated with construction of the Project.

An alternative design at the Waveney Valley (referred to as the Waveney Valley Alternative) is also being considered and is the subject of consultation and ongoing assessment. This design alternative, if taken forward, would result in changes to those elements of the Project set out below. This would instead comprise:

- installation of approximately 157 km of new 400 kV overhead line;
- installation of approximately 27 km of 400kV underground cabling (some of which is located through the Dedham Vale National Landscape (an AONB); and
- eight new CSE compounds (each with a permanent access) to connect the overhead lines to the underground cables.

All other works not listed above would remain consistent with either alternative.

In other words, the Waveney Valley Alternative, if taken forward and based on the 2024 preferred draft alignment would comprise approximately 2 km less new 400 kV overhead line and approximately an additional 2 km of 400 kV underground cabling and two additional new CSE compounds, each with a permanent access, to connect the overhead lines to the underground cables.

In addition, third party utilities diversions and / or modifications would also be required to facilitate the construction of the Project. There would also be land required for mitigation, compensation and enhancement of the environment including Biodiversity Net Gain (BNG).

As well as the permanent infrastructure, land would also be required temporarily for construction activities including for example working areas for construction equipment and machinery, site offices, welfare, storage and temporary construction access.

The 2024 preferred draft alignment as presented in this Design Development Report reflects the use of standard lattice pylons. Appendix C to this report sets out how consideration has been given to alternative pylon types, including traditional lattice, low height lattice and the T-pylon.

If progressed with significant elements of overhead line, then it is likely the Project would be classified as a Nationally Significant Infrastructure Project (NSIP), and we would need to obtain ‘development consent’ under statutory procedures set by Government.

The feedback from the non-statutory and statutory consultations (as applicable) will be used to inform the final designs that will be put forward in the application for development consent. National Grid expects to submit an application for consent for the Project in 2025.

1. Introduction

1 Introduction

1.1 Purpose of this document

1.1.1 The purpose of this report is to describe how the Norwich to Tilbury (referred to as the 'Project' in this report) has evolved since the 2023 non-statutory consultation (undertaken between June and August 2023) in response to feedback to that consultation and further environmental and engineering studies. Further back check and reviews of the Project will be undertaken in response to feedback to the 2024 statutory consultation, and in the light of ongoing surveys and assessments.

1.2 Overview

1.2.1 National Grid Electricity Transmission (NGET) referred to as National Grid within this report, owns and maintains the national high-voltage electricity transmission network throughout England and Wales.

1.2.2 The transmission network connects the power from where it is generated to the regional Distribution Network Operators (DNO) who then supply businesses and homes.

1.2.3 National Grid holds the Transmission Licence for England and Wales, and their statutory duty is to develop and maintain an efficient, co-ordinated, and economical system of electricity transmission and to facilitate competition in the generation and supply of electricity, as set out in the Electricity Act 1989.

1.2.4 National Grid is working to build a cleaner, fairer, and more affordable energy system that serves everyone, powering the future of our homes, transport, and industry. The Project would support the UK's net zero target through the connection in East Anglia of new low carbon energy generation, and by reinforcing the local transmission network.

1.2.5 It is National Grid that is developing plans for the Project'.

1.2.6 The Project is a proposal by National Grid to reinforce the high voltage power network in East Anglia. The reinforcement is needed because the existing transmission network, even with current upgrading, will not have sufficient capacity for the new renewable energy (a substantial proportion of which is generated by offshore wind) that is expected to connect to the network over the next ten years and beyond. Completion of the Project, together with other new reinforcements across the country will meet this future energy transmission demand both in East Anglia and across the UK.

1.2.7 The Project proposes to reinforce the transmission network between the existing substations at Norwich Main in Norfolk, Bramford in Suffolk, and Tilbury in Essex as well as connecting new offshore wind generation and an interconnector proposed to come ashore on, or in the vicinity of, the Tendring Peninsula.

1.2.8 If progressed with significant elements of overhead line, then Norwich to Tilbury would be classified as a Nationally Significant Infrastructure Project (NSIP) and National Grid would need to obtain 'development consent' under statutory procedures set by Government. NSIPs are projects of certain types, over a certain size, which are considered by the Government to be of national importance, hence permission to build them needs to be given at a national level, by the relevant Secretary of State (SoS) (in this case the Secretary of State for Energy Security and Net Zero). Instead of applying to

the local authority for planning permission, the developer must apply to the Planning Inspectorate for a different permission called a Development Consent Order (DCO).

1.2.9 If the Project is an NSIP National Grid would need to apply for development consent to the Planning Inspectorate. If accepted, the examining authority would be appointed (consisting of one or more examining inspectors) who, after a period of public examination, would make their recommendation to the SoS for Energy Security and Net Zero, who in turn would decide on whether development consent should be granted for the Project. The timescale between acceptance of the submission and a decision is approximately 18 months.

1.3 The need for the Project

1.3.1 Great Britain already has 8.5 gigawatts (GW) of offshore wind energy in operation, and another 1.9 GW under construction. The Government's Energy White Paper (EWP) (December 2020) outlines a plan to increase energy from offshore wind to 40 GW by 2030 (with this Government target being increased in April 2022 to 50 GW) and this Project would support achieving that target.

1.3.2 New connections for new offshore wind and nuclear power generation projects and for interconnectors into East Anglia are expected to continue in addition to the current contracted position. These new connections are being constructed or are expected to connect into substations at Necton, Norwich Main, Bramford, Friston and Sizewell. Additionally, agreements are in place with two offshore wind farm projects and an interconnector based on their connections into a new East Anglia Connection Node (EACN) substation. National Grid has a duty to facilitate new connections and maintain a safe National Electricity Transmission System (NETS) and has considered the capability of the existing network to support such connections.

1.3.3 East Anglia's 400 kV electricity transmission network was built in the 1960s. It was built to supply regional demand, centred around Norwich and Ipswich. With the growth in new energy generation from offshore wind, nuclear power and interconnection with other countries, there will be more electricity connected in East Anglia than the network can currently accommodate.

1.3.4 As a result, and to comply with its duties, National Grid needs to reinforce the electricity network to allow power to be imported to and exported from East Anglia. The reinforcement would provide additional capability to connect to areas of demand, allowing power flows cross boundaries, and linking into interconnectors to and from Europe.

1.3.5 The Project could also connect new offshore wind farms off the Essex coast and a European interconnector to the electricity transmission network. Two offshore wind farms, the North Falls Offshore Wind Farm and Five Estuaries Offshore Wind Farm, and the Tarchon Energy Interconnector (from Germany) are currently in development. If consented, they are expected to be operational by the end of 2030.

1.3.6 As part of the development of a project National Grid establishes the need and identifies a preferred strategic proposal to meet requirements. This can include multiple potential start, intermediate and end points. Options are narrowed down, and the best performing are identified. Alternative strategic options for delivering the preferred solution are developed and appraised to identify a preferred strategic proposal. This will then be the subject of consultation, feedback reviews, design evolution and testing with a back-check and review process.

1.3.7 In 2022, National Grid carried out an initial assessment of the strategic options available to meet the needs case set out above.

1.3.8 This assessment identified a range of combinations of circuit options covering both East Anglia and the south-east. For each of these combinations of options, National Grid undertook an appraisal of deliverability, considered the system benefit that the reinforcement provided, considered environmental and socio-economic factors, and considered the cost benefit analysis completed by National Grid ESO.

1.3.9 Further detail on National Grid's approach to consenting and each of the potential strategic options is provided in the Corridor and Preliminary Routeing and Siting Study (CPRSS)[1], published in April 2022 to inform the initial non-statutory consultation. The CPRSS explains why, at the early pre-statutory stage of consultation, the offshore strategic options were not being progressed for now.

1.3.10 The currently preferred strategic option that best meets National Grid obligations under Section 9 of the Electricity Act 1989 and aligns with the NPSs (EN-1 and EN-5) is the onshore overhead line option between Norwich Main and Bramford Substations, and overhead line (with underground section) from Bramford Substation, via a new EACN substation to Tilbury Substation.

1.3.11 In arriving at this preferred onshore strategic option, National Grid looked at different onshore connection locations between either Norwich Main or Necton Substations and Bramford Substation or a new substation in the Twinstead area, location options for a new substation to connect the two offshore windfarm customers, and options for Dedham Vale Area National Landscape (an AONB).

1.3.12 Details of these options and the rationale for the decisions made to date are provided in the CPRSS, the 2023 Strategic Options Backcheck and Review[2].and the 2024 Strategic Options Backcheck and Review. Further detail on how the Project progressed prior to the statutory consultation is provided in the 2023 Design Development Report[3] and the 2024 Design Development Report.

1.3.13 'Backcheck' and periodic update is undertaken to respond to new information and in order to ensure that the outcome of each stage remains valid and National Grid continues to review its proposals. As no final decision has been made, and as options will be reconsidered and backchecked throughout the process having regard to consultation responses and other relevant information, none of the conclusions should be seen as final.

National Grid Approach

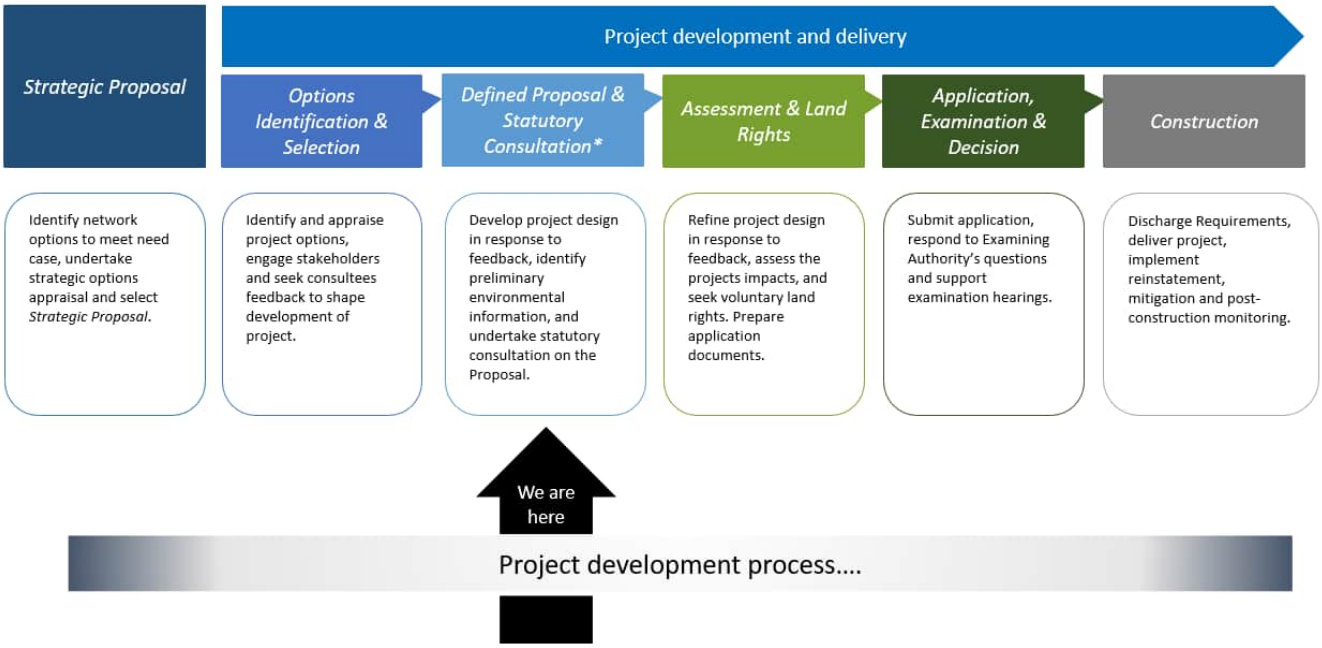
1.3.14 National Grid has adopted a structured approach to project development and consenting (see Figure 1.1).

1 https://www.nationalgrid.com/electricity-transmission/document/142461/download

2 https://www.nationalgrid.com/electricity-transmission/document/149281/download

3 ttps://www.nationalgrid.com/electricity-transmission/document/149161/download

Figure 1.1 – National Grids consenting process



1.3.15 To date National Grid has identified a Strategic Proposal and has undertaken 'Options Identification and Selection' as reported and published in the CPRSS, the 2023 Strategic Options Backcheck and Review, the 2023 Design Development Report, and the 2024 Design Development Report.

1.3.16 The Project is now the subject of a statutory consultation as set out in the Planning Act 2008. A list of all the documents produced for the statutory consultation is available on [redacted]

Project Description

1.3.17 The Project would comprise a 400 Kilovolt (kV) electricity transmission connection over a distance of approximately 184 kilometres (km).

1.3.18 Our current draft proposals for the Project, referred to as the 2024 preferred draft alignment, which are the subject of the 2024 statutory consultation, comprising:

- a new 400 kV electricity transmission connection of approximately 184 km overall length from Norwich Main Substation to Tilbury Substation via Bramford Substation comprising:

  approximately 159 km of new overhead line supported on approximately 510 steel lattice pylons (approximately 50 m in height) some of which are gantries (typically up to 15m in height) within proposed Cable Sealing End (CSE) compounds, or existing or proposed substations; and

  approximately 25 km of 400 kV underground cabling (some of which is located through the Dedham Vale Natural Landscape (an AONB).

- six new CSE compounds, each with new permanent access, to connect the overhead lines to the underground cables.

- a new 400 kV EACN substation, with a new permanent access, on the Tendring Peninsula. This is proposed to be an Air Insulated Switchgear (AIS) substation;
- substation extension works at the existing Norwich Main, and Bramford substations and works within the existing Tilbury Substation to connect and support operation of the new transmission connection; and
- temporary works associated with construction of the Project.

1.3.19 An alternative design at the Waveney Valley (referred to as the Waveney Valley Alternative) is also being considered and is the subject of consultation and ongoing assessment. This design alternative, if taken forward, would result in changes to those elements of the Project set out below. This would instead comprise:

- installation of approximately 157 km of new 400 kV overhead line;
- Installation of approximately 27 km of 400 kV underground cabling (some of which is located through the Dedham Vale National Landscape (an AONB); and
- eight new CSE compounds (each with a permanent access road) to connect the overhead lines to the underground cables.

1.3.20 All other works not listed in the above would remain consistent with either alternative.

1.3.21 In other words, the Waveney Valley Alternative, if taken forward and based on the 2024 preferred draft alignment would comprise approximately 2 km less new 400 kV overhead line and approximately an additional 2 km of 400 kV underground cabling and two additional new CSE compounds, each with a permanent access, to connect the overhead lines to the underground cables.

1.3.22 In addition, third party utilities diversions and / or modifications would also be required to facilitate the construction of the Project. There would also be land required for mitigation, compensation and enhancement of the environment including Biodiversity Net Gain (BNG).

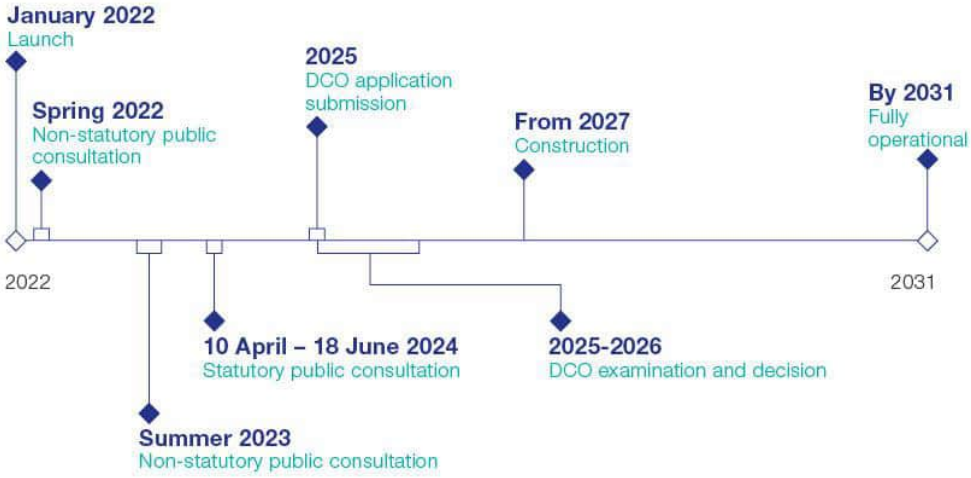
1.3.23 As well as the permanent infrastructure, land would also be required temporarily for construction activities including for example working areas for construction equipment and machinery, site offices, welfare, storage, and temporary construction access.

1.3.24 The Project would be designed, constructed, and operated in accordance with applicable health and safety legislation. The Project would also need to comply with design safety standards including the NETS Security and Quality of Supply Standard (SQSS), which sets out the criteria and methodology for planning and operating the NETS. This informs a suite of National Grid policies and processes, which contain details on design standards required to be met when designing, constructing, and operating assets such as proposed for the Project.

Project Timeline

1.3.25 A non-statutory consultation took place between April and June 2022. A further non-statutory consultation was undertaken between June and August 2023 to provide information on how the Project had developed in response to feedback from the 2022 non-statutory consultation and further environmental and engineering studies. As required under the Planning Act 2008, a statutory consultation is taking place between April and May 2024.

1.3.26 An indication of the Project timelines through to operation is provided below.



1.4 Structure of this document

1.4.1 The report is structured as follows:

- Chapter 2 – provides an overview of the legislation and national policy relevant to the Project;
- Chapter 3 – provides an overview of the 2023 non-statutory consultation;
- Chapter 4 – outlines the back check of the previous routeing and siting studies undertaken by National Grid;
- Chapter 5 – describes the 2024 preferred draft alignment and how feedback on the 2023 preferred draft alignment has influenced the proposals which are the subject of the 2024 statutory consultation;
- Chapter 6 – describes the temporary works that will be required; and
- Chapter 7 – sets out the next steps that will be undertaken prior to the submission of an application for a Development Consent Order.

1.4.2 The report also includes three Appendices:

- Appendix A – Consideration of National Policy Statements;
- Appendix B – External Schemes and Studies; and
- Appendix C - Consideration of Pylon Options.

2. Legislation and National Policy Context

2 Legislation and National Policy Context

2.1 Introduction

2.1.1 This chapter sets out a summary of legislation and national policy relevant to the Project.

2.2 Planning Act 2008

2.2.1 The Planning Act 2008 introduced a new consenting procedure for NSIPs. Under Section 14(1)(b) and Section 16 of the Planning Act 2008 and the Planning Act (Electric Lines) Order 2013 a project that involves the installation of an electric line above ground of more than 2 km, which will operate at 400 kV in England is an NSIP.

2.2.2 For an NSIP the grant of development consent is required by the making of a DCO under the Planning Act 2008.

2.2.3 Only a proposed new above ground electricity line would be an NSIP by virtue of the definitions in the Planning Act. Other development, such as underground cables, may be granted development consent as associated development within the meaning of Section 115 of the Planning Act.

2.2.4 As noted in Section 1 above if progressed with significant elements of overhead line, then Norwich to Tilbury would be classified as a Nationally Significant Infrastructure Project (NSIP) and National Grid would need to obtain 'development consent' under statutory procedures set by Government. NSIPs are projects of certain types, over a certain size, which are considered by the Government to be of national importance, hence permission to build them needs to be given at a national level, by the relevant Secretary of State (SoS) (in this case the Secretary of State for Energy Security and Net Zero). Instead of applying to the local authority for planning permission, the developer must apply to the Planning Inspectorate for a Development Consent Order (DCO).

2.2.5 Section 104 of the Planning Act 2008 states at (2)(a) that the Secretary of State must have regard to any national policy statement which has effect in relation to development of the description to which the application relates.

2.3 Electricity Act 1989

2.3.1 Section 9(2) of the Electricity Act 1989 places general duties on National Grid as a licence holder 'to develop and maintain an efficient, co-ordinated and economical system of electricity transmission…'. In addition, Section 38 and Schedule 9 of the Electricity Act 1989 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 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"*.

2.3.2 Under Licence Condition C8 (Requirement to offer terms) of the Transmission Licence Standard Conditions (OFGEM, 2022), NGET ESO has a duty to meet obligations relating to making offers to provide connections to the Transmission System. In summary, where

any person applies for an offer, National Grid shall offer to enter into an agreement(s) 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.

2.4 National planning policy

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

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

2.4.3 A more detailed review of the policies contained within the National Policy Statements is set out in Appendix A to this report.

2.4.4 Although this section and Appendix A consider the National Policy Statements designated in January 2024, as these are the policies which will be considered by the Secretary of State in reaching a decision, the Project has developed within the context of the previously adopted and emerging draft NPSs[4] and reviewed against the updated policy set out in January 2024.

Overarching National Policy Statement for Energy (EN-1) (2024)

2.4.5 NPS EN-1 sets out the Government's overarching policy with regard to the development of NSIPs in the energy sector.

2.4.6 EN-1 recognises that to 'produce the energy required for the UK and ensure it can be transported to where it is needed, a significant amount of infrastructure is needed at both local and national scale. High quality infrastructure is crucial for economic growth, boosting productivity and competitiveness'. (para 2.1.3). It continues '*There is an urgent need for new electricity network infrastructure to be brought forward at pace to meet our energy objectives*' (paragraph 3.3.65).

2.4.7 Section 3.3 recognise that the volume of onshore reinforcement works needed to meet decarbonisation targets is substantial. National Grid ESO forecasts that over the next

4 The previously adopted and emerging draft National Policy Statements are:
- Overarching National Policy Statement for Energy (EN-1) (2011)
- Draft Overarching National Policy Statement for Energy (EN-1 (March 2023)
- National Policy Statement for Energy Networks Infrastructure (EN-5) (2011)
- Draft National Policy Statement for Energy Networks Infrastructure (EN-5) (March 2023)
- Draft National Policy Statement for Renewable Energy Infrastructure (EN-3) (2023)

decade a doubling of north south power transfer capacity will be required. Specific mention is made of the need for '*substantial reinforcement in East Anglia to handle increased power flows from offshore wind generation*' (paragraph 3.3.68).

2.4.8 Section 4.2 sets out the critical national priority for low carbon infrastructure. 'Government has committed to fully decarbonising the power system by 2035, subject to security of supply, to underpin its 2050 net zero ambitions. More than half of final energy demand in 2050 could be met by electricity, as transport and heating in particular shift from fossil fuel to electrical technology' (paragraph 4.2.1) concluding that there is a critical national priority (CNP) for the provision of nationally significant low carbon infrastructure.

2.4.9 For electricity grid infrastructure, all power lines in scope of EN-5 including network reinforcement and upgrade works, and associated infrastructure such as substations are CNP.

2.4.10 EN-1 also '*sets out guidance on generic impacts of any of the types of energy infrastructure covered by the energy NPS*' in respect of matters such as air quality and emissions, biodiversity, dust and odour, flood risk, historic environment, landscape, land use, noise, and vibration, socio-economic, traffic and transport and waste management.

National Policy Statement for Electricity Networks Infrastructure (EN-5) (2024)

2.4.11 NPS EN-5 specifically relates to electricity networks.

2.4.12 As identified in EN-1, government has concluded that there is a critical national priority (CNP) for the provision of nationally significant low carbon infrastructure. '*As stated in Section 4.2 of EN-1, to support the urgent need for new low carbon infrastructure, all power lines in scope of EN-5 including network reinforcement and upgrade works, and associated infrastructure such as substations, are considered to be CNP infrastructure*' (paragraph 2.1.5).

2.4.13 As set out in EN-1 (Section 4.2) the assessment principles outlined in Section 4 of EN-1 continue to apply to CNP infrastructure. Paragraphs 2.2.1 and 2.2.2 note that '*The Secretary of State should bear in mind that the initiating and terminating points – or development zone – of new electricity networks infrastructure is not substantially within the control of the applicant'. Siting is determined by:*

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

2.4.14 Paragraph 2.2.6 recognises that '....*the locational constraints identified above do not, of course, exempt applicants from their duty to consider and balance the site-selection considerations set out below, much less the policies on good design and impact mitigation*..'.

2.4.15 Paragraph 2.2.10 of EN-5 reiterates the duties of transmission and distribution licence holders under Section 9 of the Electricity Act 1989, both in relation to developing and maintaining an economical and efficient network and in formulating proposals for new electricity networks infrastructure, to '*have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest*…'

2.4.16 Paragraph 2.4.1 notes that '*The Planning Act 2008 requires the Secretary of State to have regard, in designating an NPS and in determining applications for development consent to the desirability of good design*'.

2.4.17 Section 2.7 of the NPS deals with holistic planning. '*...the government envisages that, wherever reasonably possible, applications for new generating stations and their related infrastructure should be contained in a single application to the Secretary of State. However, a consolidated approach of this kind may not always be possible*..'.(para 2.7.2). '*This could be, for example, due to the differing lengths of time needed to prepare the applications for submission to the Secretary of State, or because a network application relates to multiple generation projects (which could be onshore or offshore), or because the works involved are strategic reinforcements required for a number of reasons*.' (paragraph 2.7.3).

2.4.18 Section 2.8 deals with Strategic Network Planning and sets out that 'A more strategic approach to network planning will ensure that network development keeps pace with renewable generation and anticipates future system needs' (this is also referred to in paragraphs 2.13.1 - 2.13.13).

2.4.19 Paragraph 2.9.7 recognises that 'the government does not believe that the development of overhead lines is incompatible in principle with applicants' statutory duty under Schedule 9 to the Electricity Act 1989, to have regard to visual and landscape amenity and to reasonably mitigate possible impacts thereon'.

2.4.20 Paragraph 2.9.16 recognise the importance of the guidelines provided in the Holford Rules 'intended as a common-sense approach to overhead line design, were reviewed and updated by the industry in the 1990s and they should be embodied in the applicants' proposals for new overhead lines. In brief the Holford Rules state that applicants should:

- avoid altogether, if possible, the major areas of highest amenity value, by so planning the general route of the first line in the first place, even if the total mileage is somewhat increased in consequence;
- avoid smaller areas of high amenity value, or scientific interests by deviation; provided that this can be done without using too many angle towers, i.e. the bigger structures which are used when lines change direction;
- other things being equal, choose the most direct line, with no sharp changes of direction and thus with fewer angle towers;
- choose tree and hill backgrounds in preference to sky backgrounds wherever possible. When a new overhead line has to cross a ridge; secure this opaque background as long as possible and cross obliquely when a dip in the ridge provides an opportunity. Where it does not, cross directly, preferably between belts of trees;
- prefer moderately open valleys with medium or moderate levels of tree cover where the apparent height of towers will be reduced, and views of the line will be broken by trees;
- where country is flat and sparsely planted, and unless specifically preferred otherwise by relevant stakeholders, 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 concentration of lines or 'wirescape'; and

- approach urban area through industrial zones, where they exist; and when pleasant residential and recreational land intervenes between the approach line and the substation, carefully assess the comparative costs of the undergrounding.

2.4.21 Paragraph 2.9.18 refers to the Horlock Rules, guidelines for the design and siting of substations) setting out that 'these principles should be embodied in applicants' proposals for the infrastructure associated with new overhead lines. In brief the Horlock Rules state that:

- consider environmental issues from the earliest stage to balance the technical benefits and capital cost requirements for new developments against the consequential environmental effects in order to keep adverse effects to a reasonably practicable minimum;
- 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;
- protect as far as reasonably practicable 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;
- take advantage of the screening provided by land form and existing features and the potential use of site layout and levels to keep intrusion into surrounding areas to a reasonably practicable minimum;
- keep the visual, noise and other environmental effects to a reasonably practicable minimum; consider the land use effects of the proposal when planning the siting of substations or extensions;
- consider the options available for terminal towers, equipment, buildings, and ancillary development appropriate to individual locations, seeking to keep effects to a reasonably practicable minimum;
- use space effectively to limit the area required for development consistent with appropriate mitigation measures and to minimise the adverse effects on existing land use and rights of way, whilst also having regard to future extension of the substation;
- make the design of access roads, perimeter fencing, earth-shaping, planting, and ancillary development an integral part of the site layout and design, so as to fit in with the surroundings;
- in open landscape especially, high voltage line entries should be kept, as far as possible, visually separate from low voltage lines and other overhead lines so as to avoid a confusing appearance; and
- study the inter-relationship between towers and substation structures and background and foreground features so as to reduce the prominence of structures from main viewpoints. Where practicable the exposure of terminal towers on prominent ridges should be minimised by siting towers against a background of trees rather than open skylines.

2.4.22 Paragraph 2.9.20 covers undergrounding '*Although it is the government's position that overhead lines should be the strong starting presumption for electricity networks developments in general, this presumption is reversed when proposed developments will*

cross part of a nationally designated landscape (i.e. National Park, The Broads, or Area of Outstanding Natural Beauty'.

2.4.23 It goes on '*However, undergrounding will not be required where it is infeasible in engineering terms, or where the harm that it causes (see section 2.11.4) is not outweighed by its corresponding landscape, visual amenity, and natural beauty benefits. Regardless of the option, the scheme through its design, delivery, and operation, should seek to further the statutory purposes of the designated landscape. These enhancements may go beyond the mitigation measures needed to minimise the adverse effects of the scheme*' (paragraph 2.9.22) and '*Additionally, cases will arise where – though no part of the proposed development crosses a designated landscape high potential for widespread and significant adverse landscape and/or visual impacts along certain sections of its route may result in recommendations to use undergrounding for relevant segments of the line*' (paragraph 2.9.23).

2.4.24 CNP is referred to again in paragraph 2.12.7: '*As highlighted in EN-1 government has concluded that there is a CNP for the provision of nationally significant low carbon infrastructure. This includes for electricity grid infrastructure, all power lines in scope of EN-5 including network reinforcement and upgrade works, and associated infrastructure such as substations. This is not limited to those associated specifically with a particular generation technology, as all new grid projects will contribute towards greater efficiency in constructing, operating, and connecting low carbon infrastructure to the National Electricity Transmission System. This includes infrastructure identified in the Holistic Network Design and subsequent strategic network design exercise*'.

National Policy Statement for Renewable Energy (EN-3) (2024)

2.4.25 NPS EN-3 also includes support for the onshore infrastructure required to deliver new offshore wind developments.

2.4.26 Section 2.8 deals with offshore wind. Paragraph 32.8.1 states that '*As set out in the British Energy Security Strategy, the Government expects that offshore wind …. Will play a significant role in meeting demand and decarbonising the energy system. The ambition is to deploy up to 50GW of offshore wind capacity (including up to 5GW floating wind) by 2030, with an expectation that there will be a need for substantially more installed offshore capacity beyond this to achieve net zero carbon emissions by 2050*'.

2.4.27 Paragraphs 2.8.24 to 2.8.33 (inclusive) reiterate the position set out in EN-1 and EN-5 that a co-ordinated approach to onshore-offshore transmission is required. Paragraph 2.8.25 states that '*The previous standard approach to offshore-onshore connection involved a radial connection between single wind farm projects and the shore. A coordinated approach will involve the connection of multiple, spatially close, offshore wind farms and other offshore infrastructure, wherever possible, as relevant to onshore networks'*.

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

National Planning Policy Framework (NPPF) (2023)

2.4.29 Paragraph 5 of NPPF states that the '*Framework does not contain specific policies for nationally significant infrastructure projects. These are determined in accordance with the decision-making framework in the Planning Act 2008 (as amended) and relevant NPSs for major infrastructure, as well as any other matters that are relevant (which may include the National Planning Policy Framework (NPFF))'*.

2.4.30 While the NPSs remain the prime decision-making documents, the NPPF may require consideration and it is therefore included here for completeness.

3 Non-Statutory Consultation 2023

3 Non-Statutory Consultation 2023

3.1 Background

Context

3.1.1 National Grid held a non-statutory consultation between 21 April 2022 and 16 June 2022. A further round of non-statutory consultation was undertaken between 27 June and 21 August 2023. The aim of this further consultation in 2023 was to:

- provide an overview of the updated proposals to the public;
- present the 2023 preferred draft alignment;
- explain where changes that had been made to the proposals since the last consultation (held in 2022);
- ensure all stakeholders had the opportunity to provide feedback on the work to date; and
- outline next steps and the programme, and how proposals would be developed further.

The Consultation Corridor

3.1.2 An overview of the preferred draft alignment, as presented at the 2023 non-statutory consultation, was provided in the 2023 Project Background Document[5] and is set out below.

South Norfolk

3.1.3 The proposed new reinforcement would start at Norwich Main Substation in Norfolk. Out of Norwich Main, the proposed overhead line would head south, running to the east of Mulbarton, Tacolneston and Shelfanger before routeing to the west of Roydon on the border with Mid Suffolk.

[5] nationalgrid.com/electricity-transmission/document/149151/download

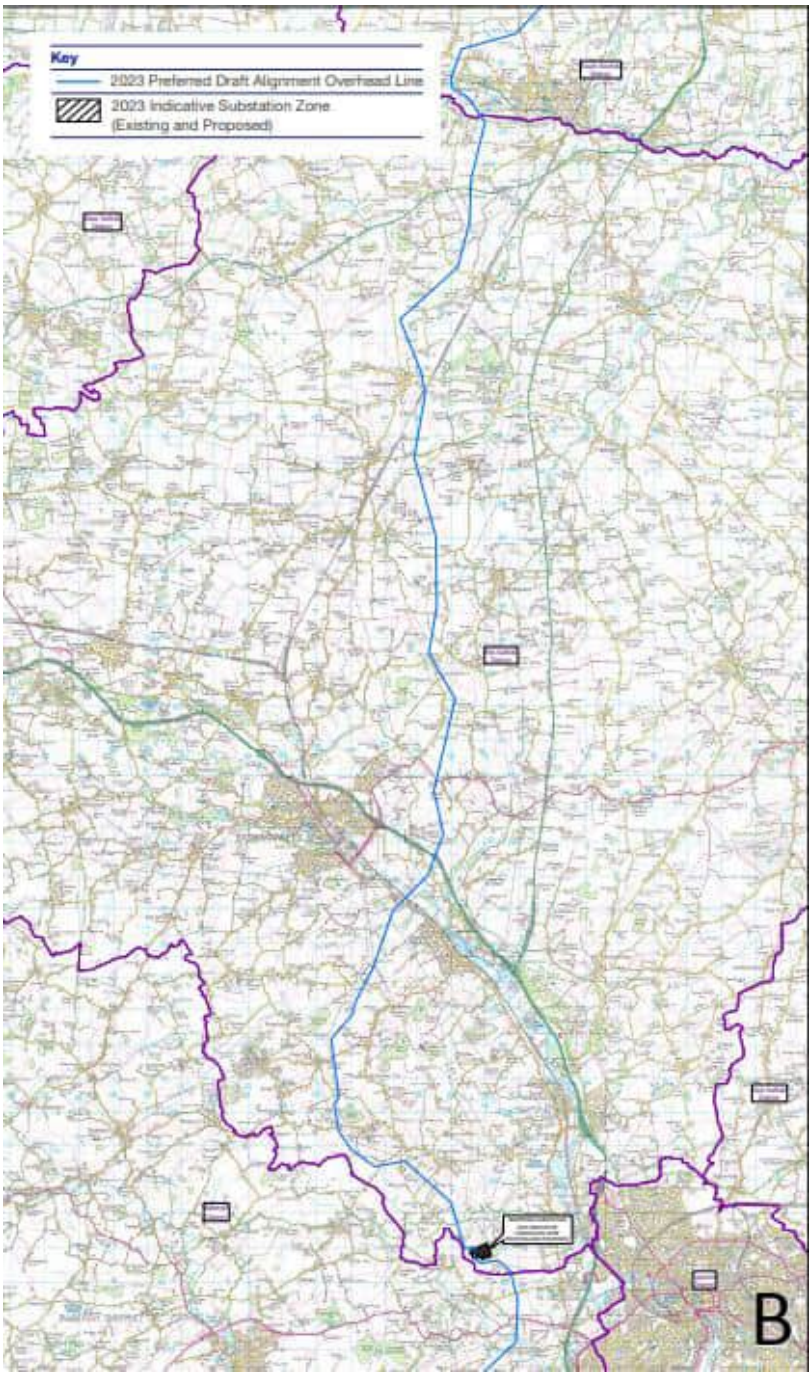
Figure 3.1 Route overview – South Norfolk



Mid Suffolk (and Babergh North of the Substation)

3.1.4 From the county boundary between South Norfolk and Mid Suffolk, the overhead line would run south, passing to the west of Mellis and to the east of Gislingham before crossing the railway. It would then continue south past Stowupland and Needham Market, where it would cross back over the railway, before turning eastwards at Offton, running north of Flowton, and connecting into Bramford Substation. Some work would be required at Bramford Substation to connect the new line into it.

Figure 3.2 Route overview – Mid Suffolk (and Babergh north of the substation)



Babergh, Tendring and Colchester

3.1.5 From Bramford Substation, the proposed overhead line would cross immediately into the district of Babergh.

3.1.6 It would then run south-easterly, passing to the west of Washbrook and Copdock and Little Wenham and passing the north side of Notley Enterprise Park. Here the overhead line would transition to underground cable at a CSE compound adjacent to the south-western corner of Notley Enterprise Park.

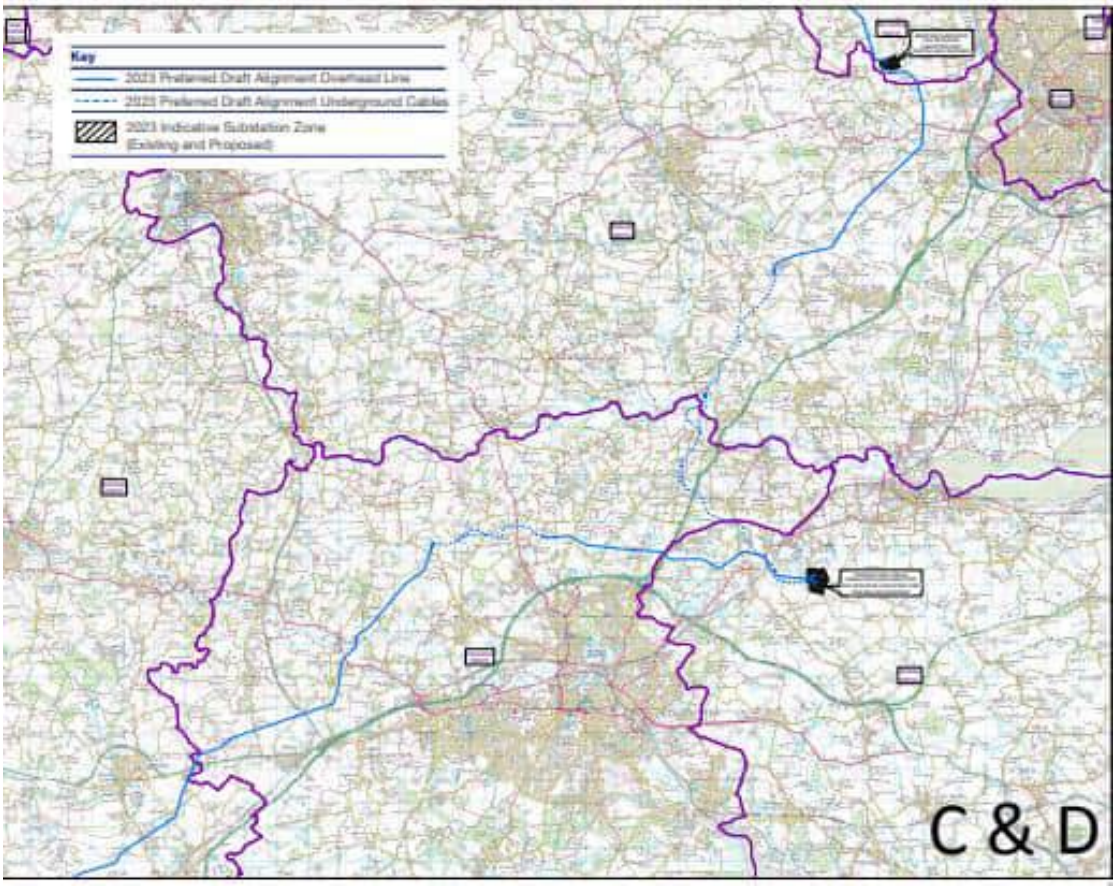
3.1.7 The underground cable alignment would then run to the east of Raydon and west of Holton St Mary. It would then cross the border into the Colchester district briefly, running past the east of Langham and crossing the A12. The underground cable alignment would then cross into the Tendring district, turning eastwards into the Tendring Peninsula,

passing the north of Ardleigh, and crossing the railway to the site of the EACN substation. Underground cables are proposed in this section, crossing the designated Dedham Vale AONB.

3.1.8 From the EACN substation, the overhead line alignment would head west out of the substation, crossing back over the A12 towards Great Horkesley. Here the overhead line would transition to underground cable at a CSE compound sited to the north-east of Horkesley plantation. Due to limited space and to reduce the extent of tree removal, the underground cable alignment is expected to require a split corridor arrangement to the south of Knowles' Farm before reaching another CSE compound to the west of Crabtree Lane, where the underground cable would transition to overhead line.

3.1.9 From here, the overhead line alignment would continue south-west, passing to the west of West Bergholt before crossing the A12, running north of Marks Tey and into the Braintree district.

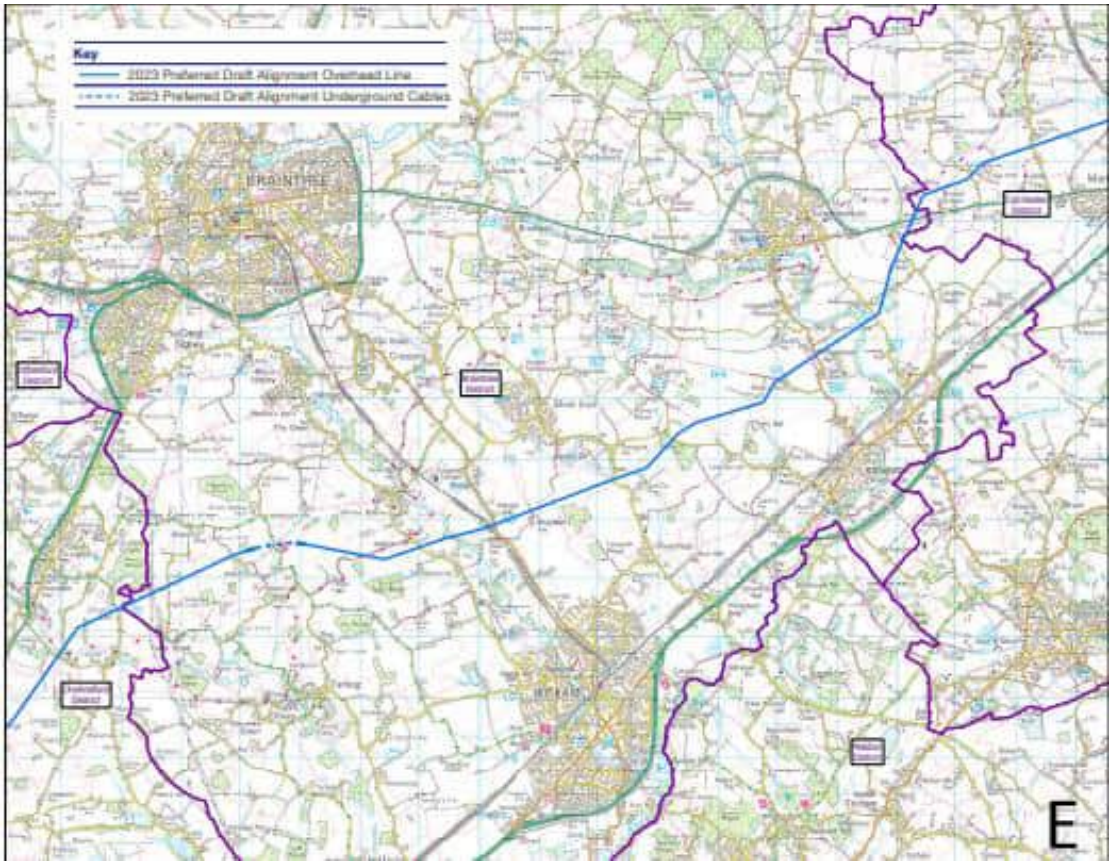
Figure 3.3 Route overview – Babergh, Tendring & Colchester



Braintree

3.1.10 After crossing into the Braintree district, the overhead line alignment would continue south-west. The alignment would pass to the north of Witham and the south of Silver End before crossing the railway, again heading south-west into Chelmsford district.

Figure 3.4 Route overview – Braintree



Chelmsford

3.1.11 The overhead line alignment would enter the district from the north-east and would run to the north of Chelmsford. From there it would head south on the western side of the City, and to the west of Writtle. The alignment would then continue south, passing to the west of Margaretting, and crossing over the A12 to the north of Ingatestone on the Brentwood district border, it briefly re-enters Chelmsford district to the east of Ingatestone.

Figure 3.5 Route overview – Chelmsford



Basildon and Brentwood

3.1.12 Passing to the north and east of Ingatestone, the overhead line would cross the A12 and the railway in the north of the Brentwood district. It would then travel directly south, crossing multiple times between the Chelmsford, Basildon, and Brentwood districts. Passing to the east of Brentwood and the west of Billericay, the alignment would continue south, crossing the A127 and railway on the border of the Thurrock district.

Figure 3.6 Route overview – Basildon and Brentwood

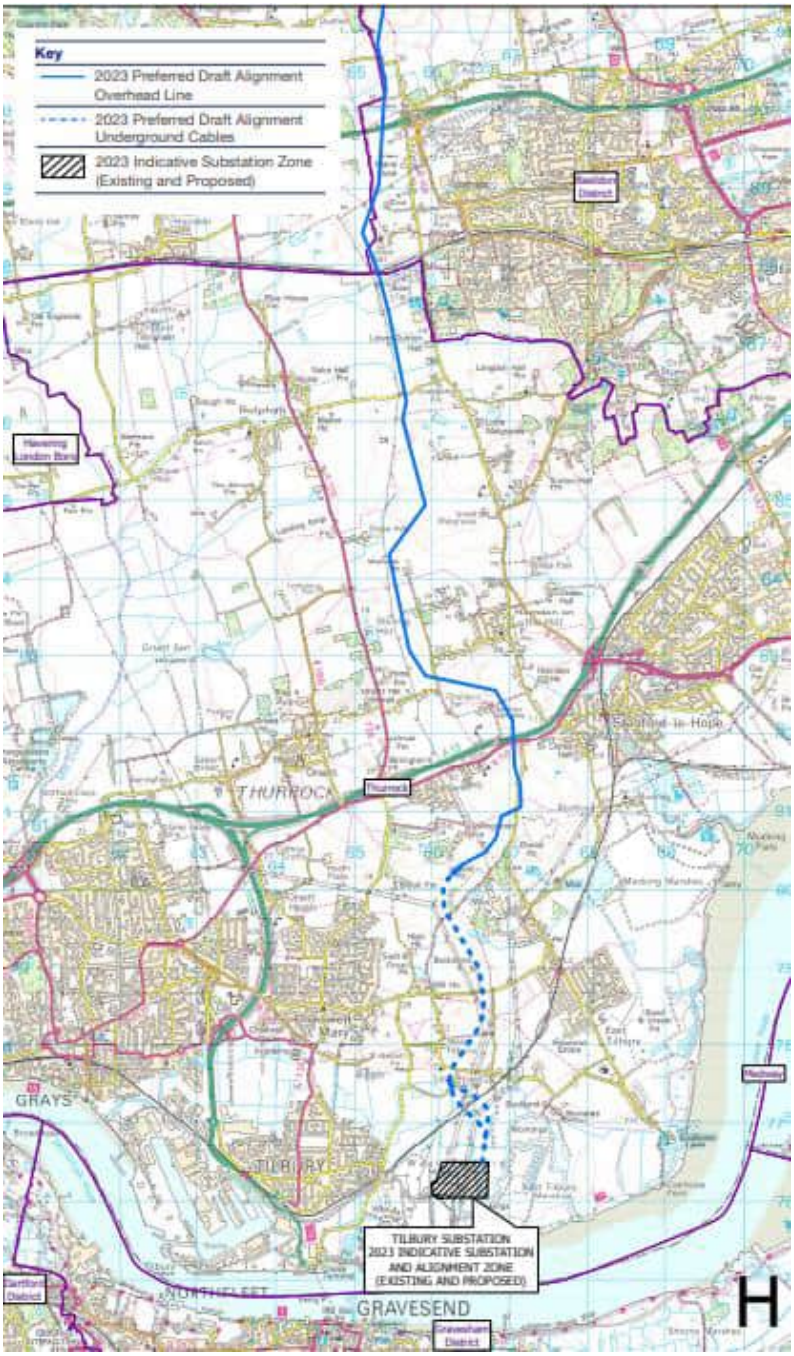


Thurrock

3.1.13 The overhead line alignment would continue south, passing Bulphan to the west and Horndon on the Hill to the east. It would then head east, then south, crossing the A13 to the north-east of Southfields, before heading south, to the west of Linford. Here, the overhead line would transition to underground cable at a CSE compound, proposed to be sited to the north of the Lower Thames Crossing proposals. The underground cable alignment would then run south into Tilbury Substation.

3.1.14 Works would be required at Tilbury Substation to connect the new reinforcement into the substation.

Figure 3.7 Route overview – Thurrock



3.2 Responses to 2023 non-statutory consultation

3.2.1 A total of 4167 feedback submissions were received during the consultation period from local communities, stakeholders, and other consultees. This comprised of paper response forms, online response forms, emails, and letters.

Process

3.2.2 The feedback received during the 2023 non-statutory consultation has been carefully reviewed and considered, alongside ongoing technical work on the engineering design and the environmental impact assessment process.

3.2.3 Feedback that proposed design changes was carefully considered in the context of environmental and socio-economic constraints and opportunities, engineering feasibility and cost, and planning policy considerations.

3.2.4 The process of considering the proposed changes comprised of an initial filter for benefit and feasibility, an assessment incorporating inputs from relevant technical experts, and further stages of additional study if required.

3.2.5 The outcome of the consideration of potential design changes was either that it informed the current draft proposals, or that the change was not considered further following balanced and informed consideration. The current draft proposals will be subject to ongoing back-check and review in response to all feedback and further engineering and environmental studies.

Key Changes

3.2.6 Feedback responses commented on the proposed location of the permanent assets such as the location of individual pylons, sections of underground cables and CSE compounds.

3.2.7 The areas where the most extensive changes to the 2023 preferred draft alignment have been made are:

- South of Norwich Main Substation between RG01 and RG07;
- around 2 km in the Waveney Valley between approximately RG84 and RG90 (potential for the use of underground cable on a slightly modified alignment referred to as the Waveney Valley Alternative);
- East of Wortham near Brook Farm Airstrip between RG90 and RG100;
- North and west of Mellis Common between RG103 and RG116;
- South of Offton between RG191 to RG200;
- to the North of the AONB between approximately JC26 to JC34, moving the CSE compound to the north of Raydon airstrip;
- moving the western CSE compound at Fairstead to the east; and
- adoption of the existing gas pipeline corridor at Dunton Hills for the overhead line alignment.

3.2.8 Further details on the consideration of proposed changes to the 2023 preferred draft alignment, the changes summarised above, and the further development of the Project design since the 2023 non-statutory consultation, are provided in Chapter 5 of this report.

4. Backcheck and review

4 Backcheck and review

4.1 Context

4.1.1 The development of any project is always evolving and iterating as the knowledge about the project, and the potential areas in which it will be sited, grows and / or alters. In addition, previous preliminary assumptions and/or decisions are the subject of constant checking and backchecking as part of the consideration and engagement process. Any description of the assessment and rationale for non-final decisions (particularly at non-statutory stages of a potential project) must be understood in that context.

4.1.2 This chapter provides a backcheck and review, following the 2023 non-statutory consultation, of the previous stages of the Projects development as undertaken in the:

- Strategic Options Backcheck and Review 2023[6]; and
- Corridor and Preliminary Routeing and Siting Study (CPRSS) 2022[7].

4.2 Strategic Proposal

Background

4.2.1 The need for the Project was identified as critical to take forward in both the 2021 and 2022 editions of the Network Options Assessment (NOA) 2021/22 Report (National Grid ESO, 2022).

4.2.2 An appraisal of strategic options (set out in the CPRSS) established the need case for the Project in more detail and identified a preferred strategic proposal. The preferred Strategic Proposal included three distinct elements:

- an offshore reinforcement between the south coast and East Anglia (whilst subject to separate study this was identified as between Sizewell and Richborough and referred to as the SEA Link project);
- onshore reinforcement between Tilbury and Grain; and
- onshore reinforcement between Norwich and Tilbury.

Strategic Options Backcheck

4.2.3 The Norwich to Tilbury 2023 Strategic Options Backcheck and Review (2023 SOBR) was prepared by (NGET) as part of the ongoing strategic options assessment and decision-making process involved in promoting new transmission projects.

4.2.4 The 2023 SOBR explained that, without reinforcement, the transmission system in East Anglia will have insufficient capacity to accommodate contracted and predicted growth in generation connecting in the area. Following consideration of options to meet system need the 2023 SOBR proposed to continue to take forward an interim preference of an onshore combination of:

6 https://www.nationalgrid.com/electricity-transmission/document/149281/download

7 nationalgrid.com/electricity-transmission/document/142461/download

- overhead line from Norwich Main to Bramford; and
- overhead line from Bramford via a new substation to Tilbury, with undergrounding through the Dedham Vale AONB.

4.2.5 Following the publication of the 2023 SOBR and the 2023 non-statutory consultation revised National Policy Statements have been published and the amount of generation from signed connection agreements has been reviewed. A further backcheck has been undertaken and the 2024 SOBR confirms that the interim preference for the onshore combination outlined above remains unchanged.

4.2.6 In addition to the considerations in the 2024 SOBR a number of other external announcements and publications have been issued since the 2023 non-statutory consultation. These include:

- the Offshore Co-ordination Support Scheme (OCSS);
- The Electricity System Operator East Anglia Network Study (March 2024); and
- publication of the 'East Anglia Transmission Network Reinforcement' commissioned jointly by Essex, Suffolk, and Norfolk County Councils (produced by Hirons Smart Energy Networks) published in 2023T March 2024).

4.2.7 These are summarised in Appendix B to this report (External schemes and studies).

4.3 Corridor and Preliminary Routeing and Siting Study

Options identification and selection

4.3.1 Following the optioneering process and the identification of the strategic proposal, routeing and siting was undertaken, resulting in the identification of a preferred corridor as reported in the CPRSS. The preferred corridor, as identified in the CPRSS, was consulted on at the non-statutory consultation in 2022. The backcheck and review described above (from paragraph 4.2.3), has concluded that at the current stage the preferred Strategic Proposal which provided the context for the CPRSS remains the same.

4.3.2 The 2024 backcheck and review exercise has been undertaken to identify whether there have been changes since the 2023 non-statutory consultation that may affect the conclusions of the CPRSS. The back check and review considered whether the changes set out below would have resulted in a different outcome for the CPRSS:

- changes to the legislative and policy context (including National Policy Statements 2024);
- changes to project assumptions and parameters;
- changes to the baseline; and
- changes proposed in feedback to the 2023 non-statutory consultation.

Legislative and Policy Context

4.3.3 National Grid has noted the UK government's nomination, of various areas of the east coast as part of the East Atlantic Flyway UNESCO World Heritage Site (WHS). This would bring together a coastal network of wetlands and protected spaces that include

Marine Protected Areas, Ramsar Sites, Special Protection Areas, and Special Areas of Conservation.

4.3.4 There have been no further announcements since the non-statutory consultation in 2023 and National Grid's current assumption continues to be that, if the nomination is successful, then any future management plan, would comprise similar protections to those applying to these designated sites as at present. The existing designations and protections were considered as part of routeing and siting as set out in the CPRSS, and as such it is not considered that the potential WHS designation is inconsistent with or would be undermined by the proposals.

4.3.5 As noted in Chapter 2 (and Appendix A) of this report the new National Policy Statements (EN-1, EN-3, and EN-5) and National Planning Policy Framework were published in January 2024 and December 2023 respectively. No changes have been identified in those documents that have implications for the backcheck.

4.3.6 In November 2023, following a review, all AONBs were renamed as 'National Landscapes' (noting they are renamed in policy but still referred to as AONBs in legislation). On 26th December 2023, a new duty came into force in English National Landscapes. This duty says that all '*relevant authorities*' (generally, those with a public function), 'must seek to further the purposes' of the designated landscape; for National Landscapes, this purpose is conserving and enhancing natural beauty'. This duty is set out in Section 245 of the Levelling UP and Regeneration Act 2023[8].

4.3.7 AONBs were considered within the CPRSS, and the recent changes would not have affected the conclusions.

Assumptions and Parameters

4.3.8 The high-level assumptions and parameters have been reviewed and the following concluded:

- the objectives and strategic context of the Project are unchanged and remain valid. The inherent need for the Project to reinforce the National Electricity Transmission System and connect new low carbon generation to meet the government's Net Zero commitments remains with new connections exceeding system capacity;
- the approach to Routeing and Siting and the Options Identification and Selection Process continues to be as set out in Chapter 3 of the CPRSS;
- the grant funding awarded under the OCSS does not, at this stage, change the requirement for the EACN substation as part of the Project;
- until such time as studies conclude and connection agreements are modified, National Grid must continue to meet its licence obligations and progress with studies to fulfil the signed agreements for connections at the EACN substation;
- the customers with signed connection agreements at the EACN substation are currently continuing to progress their projects connecting at the EACN substation;
- an increase in the proposed extent of underground cable in response to further feedback from the 2023 non-statutory consultation and further evaluation is not considered to change previous decision making on the preferred corridor; and

8 https://www.gov.uk/government/news/new-laws-to-speed-up-planning-build-homes-and-level-up

- the levels of constraint represented by each category of environmental receptor remain the same as those set out in the CPRSS.

Baseline Conditions

4.3.9 The baseline information for those topics covered by the CPRSS has been reviewed to establish if there have been any relevant changes since completion of the CPRSS that may have changed the decision making. In conclusion:

- biodiversity and historic environment - there have been no material changes to the baseline, i.e. no new designations have been confirmed;
- landscape and views - the renaming of the Dedham Vale Area of Outstanding Natural Beauty to a 'National Landscape' does not materially alter the sensitivities, although there has been a strengthening of the duty for relevant authorities to 'seek to further' their purposes. We have taken account of the policy update in our technology selection and routeing as well as considering its relevance to consideration of mitigation as the project detail is refined through to Development Consent Order submission; and
- landscape character; landscape designations; recreational routes; and residential properties - no material changes to the baseline have been identified.

4.3.10 The planning baseline has also been reviewed with respect to planning allocations and planning applications.

4.3.11 There has been no change to the planning allocations baseline, however, there have been a number of planning applications for development within the consultation corridor, for example solar farms and battery energy storage systems. Whilst important considerations for the development of an alignment, none of these applications would have altered the identification of the 2022 consultation corridor as the preferred option.

Consultation Feedback

4.3.12 Feedback received to the 2023 non-statutory consultation and the development of the 2024 preferred draft alignment has resulted in changes outside the 2022 consultation corridor. The changes made, whether prompted by feedback, assessments or in response to technical appraisal are set out in Section 5 below.

Conclusion

4.3.13 On the basis of the information set out above it has been concluded that the current preferred Strategic Proposals which provided the context for the CPRSS remains valid and an appropriate basis on which to take the Project forward at this stage.

4.3.14 No further changes have been identified which would result in a change to the consultation corridors set out in the CPRSS other than those areas which were the subject of the 2023 non-statutory consultation.

4.3.15 National Grid will continue to backcheck and review its proposals as the Project progresses and will respond to any new baseline information, legislative changes and feedback received.

5. Development of the 2024 Preferred Draft Alignment

5 Development of the 2024 Preferred Draft Alignment

5.1 Policy Context

5.1.1 The context throughout the development of the Project is set by legislation and the policy framework within the Electricity Act and National Policy Statements EN-1, EN-3, and EN-5. Earlier stages of the Project were developed in the context of the 2011 versions of the NPS and the subsequent consultation drafts. This stage has been updated with the new NPSs published in 2024 the details of which, are summarised in the preceding sections of this report, and in more detail in Appendix A.

5.2 Introduction

Overview

5.2.1 For the purposes of this report and the initial preliminary environmental impact assessment, the 2024 preferred draft alignment as presented in this document reflects the use of standard lattice pylons and where pylons, underground cables, CSE compounds (where underground cables join with overhead lines) and where the new EACN substation might be located. Consideration of alternative pylon designs (including 'traditional lattice, low height lattice and the T-pylon) is set out in Appendix C. At the current time the Project is being progressed with traditional lattice pylons however this will continue to be back checked with the final design being submitted in the application for a DCO (if an overhead line is progressed).

5.2.2 Feedback received from the 2023 non-statutory consultation (also back checked against 2022 consultation feedback) led to the identification of a number of potential design changes. These changes have been carefully considered in the context of environmental and socio-economic constraints and opportunities, engineering feasibility and cost, and planning policy.

5.2.3 The process of considering design changes comprised of

- an initial filter for benefit and feasibility;
- an assessment incorporating inputs from relevant technical experts; and
- further stages of additional study if required.

5.2.4 The outcome, following balanced and informed consideration, was either that a change was included in the Project design, or that the proposed change was not preferred (for example it might create other environmental impacts that would outweigh the benefit the change might otherwise create) and therefore no change was made.

5.2.5 The areas where the most extensive changes to the 2023 preferred draft alignment have been made are:

- South of Norwich Main Substation (described from paragraph 5.4.13);
- around 2 km in the Waveney Valley (potential for the use of underground cable on a slightly modified alignment referred to as the Waveney Valley Alternative) (described from paragraph 5.4.31);

- East of Wortham near Brook Farm Airstrip (described from paragraph 5.4.59);
- North and west of Mellis Common (described from paragraph 5.4.64);
- South of Offton (described from paragraph 5.4.89);
- to the North of the AONB, moving the CSE compound to the north of Raydon airstrip (described from paragraph 5.4.104);
- moving the western CSE compound at Fairstead to the east (described from paragraph 5.4.171); and
- adoption of the existing gas pipeline corridor at Dunton Hills for the overhead line alignment (described from paragraph 5.4.211).

5.2.6 When specific changes are requested in respect of an individual pylon or a small number of pylons, their implementation has knock on effects along the alignment. For example, a request to move a specific pylon out of a main view from a property is likely to require the position of a number of pylons to either side of that pylon to be adjusted to even out the span lengths between pylons.

5.2.7 Similarly moving a pylon off the alignment, to increase separation from a feature, would typically see the alignment and pylon positions to each side adjusted, potentially as far as the next angle pylon where the alignment changes direction. This approach was preferred over the alternative of adding multiple angle pylons to achieve a localised change. As an example, achieving a 50 m change westwards to reduce effects around pylon RG033[9] has required small adjustments to the positions of ten pylons (all by less than around 50m) along a 3.7 km section of the 2023 preferred draft alignment (see paragraph 5.4.21 below) with the potential effects from each pylon's adjustment considered in decision making. Such changes were carefully considered to ensure that movement to reduce one effect does not lead to material change in other effects or to other receptors.

5.2.8 The total length of proposed underground cable has increased by around 1.3 km. An additional section of approximately 2 km of underground cable has also been considered for the Waveney Valley (the Waveney Valley Alternative), with a final decision subject to feedback and additional study findings.

5.3 Whole Route Feedback

5.3.1 Before the individual changes are described, this section provides a review of feedback received that related to the whole route.

Offshore or predominantly offshore connection

5.3.2 Various respondents stated or restated a preference for an entirely offshore or predominantly offshore connection alternative. A response to providing the connection offshore was published in the Strategic Options Backcheck and Review[10] as part of the 2023 non-statutory consultation. A further review has been completed and set out in the

[9] Pylon and gantry numbering is sequential from north to south with a two-letter prefix. The prefix is RG for the section from Norwich to Bramford, JC from Bramford to the EACN substation and TB from the EACN substation to Tilbury.

[10] https://www.nationalgrid.com/electricity-transmission/document/149281/download

2024 Strategic Options Backcheck and Review published as part of the 2024 statutory consultation.

5.3.3 The 2024 SOBR and preceding sections of this document explain that there have been.

- no substantive relevant changes to policy to alter the interpretation of a presumption of the general acceptability of overhead lines in most onshore situations;
- no substantive change in relative cost position between overhead line, underground cable or offshore HVDC to lead to a change in preferred solution;
- no change in the need case, therefore the need for the reinforcements identified in the preceding studies remains; and
- changes in legislation that have been taken into account in our back check of the proposals and our previous decision making on routeing, connection technology and mitigation.

5.3.4 As noted in Section 4 of this report the conclusions drawn continue to remain valid and appropriate and the preference for an onshore connection solution for the Project is unchanged.

Underground cable for the whole route

5.3.5 A number of respondents stated a preference for the use of underground cable for the whole route, though it is important to note that some also expressed a preference for the Project to avoid the use of underground cables.

5.3.6 NPS EN-5 paragraph 2.9.7 (as noted in Section 2 and Appendix A to this report), whilst acknowledging that there can be adverse effects, states that 'the government does not believe that the development of overhead lines is incompatible in principle with applicants' statutory duty under Schedule 9 to the Electricity Act 1989, to have regard to visual and landscape amenity and to reasonably mitigate possible impacts thereon, in practice new overhead lines can give rise to adverse landscape and visual impacts'.

5.3.7 It goes on 'Although it is the government's position that overhead lines should be the strong starting presumption for electricity networks developments in general, this presumption is reversed when proposed developments will cross part of a nationally designated landscape (i.e. National Park, The Broads, or Area of Outstanding Natural Beauty)' (paragraph 2.9.20).

5.3.8 Paragraph 2.9.23 goes on 'Additionally, cases will arise where – though no part of the proposed development crosses a designated landscape – a high potential for widespread and significant adverse landscape and/or visual impacts along certain sections of its route may result in recommendations to use undergrounding for relevant segments of the line or alternatively consideration of using a route including subsea cabling'.

5.3.9 Taking this policy context into consideration, and balancing several factors, National Grid is proposing the use of underground cable in the following locations:

- where the 2024 preferred draft alignment is routed through or is in very close proximity to the Dedham Vale Natural Landscape (an AONB) (where NPS EN-5 supports the use of underground cable); and
- at the Waveney Valley Alternative, where National Grid is also gathering information and seeking feedback to inform decision making about the use of underground cable for the Waveney Valley crossing. This accords with NPS EN-5

paragraph 2.9.23 as we are considering the balance between additional environmental effects (in particular on ecology, archaeology, and peat soils) and additional costs with potential benefits (most notably, reduced landscape effects and reduced effects on the setting of a Grade I listed church).

5.3.10 Additionally, for technical reasons the use of underground cable is proposed:

- at the crossing of an existing 400 kV overhead line (to the north of Fairstead); and
- for the complex crossings (including the proposed Lower Thames Crossing, existing electrified Rail line and for existing overhead line connections) required to achieve line entry to the existing Tilbury Substation.

5.3.11 Elsewhere the 2024 preferred draft alignment is outside designated areas (AONB etc) and, in the absence of other or additional factors and no new material considerations being identified, the use of an overhead line is considered to be consistent with national policy. The use of underground cable for the whole of the route therefore remains less preferred.

Close parallel of existing 400 kV overhead line

5.3.12 Several respondents also restated their preference for the Project to close parallel existing 400 kV overhead lines although no additional factors or new material considerations, beyond those already considered through the design development activities, were presented within feedback to support this preference.

5.3.13 National Grid recognises that close paralleling has the potential to reduce the level of effects that may arise from a new overhead line. For this Project, close paralleling, is considered to lead to greater effects for the reasons outlined below:

- the number of residential properties in close proximity to the existing 400 kV overhead lines - close paralleling would result in a number of properties having overhead lines close to both / multiple sides;
- locations where the combination of existing physical and environmental features (railway and road infrastructure, commercial and residential property, woodlands, and orchards etc) present very substantial challenges to successful parallel routeing; and
- increased environmental effects where the overhead lines would have to converge and diverge.

5.3.14 Although there are some localised areas where close paralleling may appear beneficial, it remains National Grid's view that the introduction of a new overhead line, separated from existing 400 kV overhead lines, would overall be preferred.

5.3.15 The use of underground cable technology (with the additional CSE compounds) to cross existing overhead lines may be able to address constrained locations in isolation. However, the additional costs, along with the limitations on the ability to secure the necessary number of outages required for construction, mean that this would be less consistent with National Grid's duties and relevant policies.

Close paralleling other infrastructure (roads, rail, gas pipelines etc)

5.3.16 Feedback also noted a preference for new overhead line infrastructure to close parallel existing, or be constructed with, other existing or proposed infrastructure. The potential for reduced overall construction effects was cited on the basis that any disturbance from construction effects could be limited to the same corridor.

5.3.17 There could be potential benefits from infrastructure being concentrated, i.e., by routeing the Project in close proximity to the other infrastructure. The benefits would however only arise if construction programmed closely align and work areas were separated sufficiently so that projects could progress without interference with each other. Constraints to routeing such as residential properties, hamlets, villages, and towns located along, and in close proximity to, existing infrastructure are likely to prevent parallel routeing and would likely result in a new overhead line requiring multiple changes in direction to remain broadly parallel. The combination of existing physical and environmental features (such as railway and road infrastructure, commercial and residential properties, woodlands, and orchards) present very substantial challenges to routeing.

5.3.18 Overall, therefore it is considered that close paralleling existing, new, or proposed infrastructure should be considered on a case-by-case basis. Although in some circumstances the nature of the infrastructure may create a routeing opportunity, more typically close paralleling would not be certain to reduce environmental effects, improve compliance with the Holford Rules or be more consistent with the requirement to be economic and efficient.

5.3.19 Specific feedback referenced the A12 and a new Anglian Water supply pipeline. National Grid does not consider that close paralleling the new Anglian Water pipeline (proposed in the vicinity of the AONB) nor the A12 works offer any advantages. These other elements of infrastructure have different start and finish points to the Project therefore limiting the area over which the potential for benefits may be available. In areas of proximity and thus potential benefit, the available space for the routeing of a 400 kV connection, in both these cases, is constrained by the presence of residential properties, physical constraints, and environmental features. The result of which would be additional direction changes and / or greater environmental effects. The less optimised routeing to connect with the limited areas of potential paralleling for these options is therefore considered to be less preferred than an optimised and more direct 400 kV connection.

5.3.20 The different timings of projects and construction requirements further limits the potential for shared temporary construction infrastructure which would potentially reduce effects. For example, the Anglian Water pipeline is expected to be installed and land restored towards the end of 2024, which is before an application for the Project will be made.

5.3.21 Elsewhere, there is a preference for a change to closely follow an existing gas pipeline through and in the vicinity of the Dunton Hills Garden Village proposals. In this case the presence of the gas pipeline creates a corridor free from built development, due to established safety requirements. The extent of such zones varies with the pressure and pipe diameter but is typically in the order of 80 m for high pressure transmission infrastructure such as that near Dunton Hills Garden Village. This safety zone creates an opportunity for the route of an overhead line, noting that such routeing needs to be carefully balanced against other effects that may occur for example to ecological or residential receptors etc. The specific balance in this area is discussed further in paragraphs from 5.4.211. These paragraphs set out how the decision has been made to follow the gas pipeline in the vicinity of Dunton Hills Garden Village area whereas the same gas pipeline cannot be followed further to the north in the vicinity of Herongate Woodland Cemetery.

Coastal Corridors

5.3.22 A number of respondents reiterated their preference that routes closer to the coast should be taken forward for the Project because they considered this would be less impactful on residential properties (both existing and proposed). Although this may be the

case in particular locations, as set out in the CPRSS, options closer to the coast (passing to the south-east of Colchester and Chelmsford) would have increased effects on the qualifying features associated with European designated sites (which collectively have also been proposed to be put forward as a World Heritage Site (the East Atlantic Flyway see Section 4.3 of the 2023 Design Development Report)). The SAC and SPA coincide with sites also designated variously as Ramsar, SSSI and National Nature Reserves. As no new material considerations or additional factors have been identified, these options continue to be less preferred, due to the potential impacts on the European designated sites, and they have therefore not been progressed. The 2024 preferred draft alignment (building on the 2022 consultation corridor and 2023 preferred draft alignment) provides an alternative without such effects.

5.4 Location Specific Feedback

5.4.1 This section describes the more substantive changes made to the 2023 preferred draft alignment in response to feedback, site surveys and preliminary assessment findings. It also explains why other proposed changes raised through feedback are considered less preferred and have not been taken forward. The 2023 Non-Statutory Consultation Feedback Report provides further details on all the proposed changes (both those accepted as well as those not taken forward).

5.4.2 In some locations the pylon numbers change between 2023 and 2024 draft alignments with the text stating which alignment it refers to. Where no alignment year is stated then the numbering has not changed between the 2023 and 2024 draft alignments. Figures are included in the following section to support understanding of the text and to illustrate the more complex changes from the 2023 preferred draft alignment (brown alignment and pylon positions) to the 2024 preferred draft alignment (blue alignment and pylon positions). The 2022 consultation corridor is also included on the figures and shown along with statutory designations. Other consultation materials cover the whole of the 2024 preferred draft alignment and show draft order limits (the area within which temporary works and permanent assets will be sited and where activities to construct the Project will occur) and other detail including environmental constraints.

5.4.3 In several cases respondents repeated previous requests for a change but provided no additional evidence, to support their stated preference for the alternative. All such requests were considered, and previous decision making was reviewed in the light of additional survey findings and baseline studies.

Interface with third party activities

5.4.4 Proposed built development (i.e. proposals for new development such as new housing, warehouses, and certain changes of land use) that has some status in the planning system has been considered. In order to inform design responses a ‘cut-off date’ of 31st December 2023 has been applied. Any subsequent publication of further development proposals will be considered through the Statutory Consultation response process. The status of those considered includes:

- sites being identified within the local development plan (or advised to us directly by Local Planning Authorities as a site of future development);
- sites identified within Regulation 18 / 19 proposals of the Local Plan/ Minerals Plan making process. Some down selection of sites must have been undertaken and a preferred site / sites have been identified or there is a strongly implied

likelihood of the site progressing to allocation in the near future given the absence of key constraints;

- having been the subject of a request for, or received, an EIA screening or scoping opinion; or
- being the subject of a submitted planning application.

5.4.5 Proposed development sites at earlier 'call for sites' stages have not been considered given the high proportion of such sites that are put forward, but which often do not progress. Feedback from individual landowners relating to future development aspirations / plans but without the evidence of planning status as set out above has also not been considered at this stage. This is however a constantly evolving list of proposed developments. We will continue to monitor and backcheck emerging developments against our proposals through to submission of the application.

5.4.6 Proposed developments (within the criteria set out above) have been considered on a case-by-case basis, balancing consistency with the Holford Rules against potential direct and indirect effects on the Project. The potential 'to avoid' has been balanced against less consistency with the Holford Rules (i.e. a less direct route with more angle changes to route around a development) with the potential to reduce direct (e.g. loss of developable land) and indirect (e.g. commercial return) effects.

5.4.7 The ability to route across, through or between development proposals (to achieve more direct alignments more consistent with the Holford Rules) has also been considered and balanced against the potential effects on the proposed development. There are a number of locations, for example, where the arrangement of panels within solar farms is such that generation panels could be oversailed (i.e. not directly impacting the number of panels) resulting in a more direct alignment, has been balanced against the limited impact from construction or operation.

5.4.8 Similarly, development proposals may be constrained by existing on-site features which may create a corridor opportunity for new transmission infrastructure. As set out previously, gas pipelines, for example, have associated safety corridors which restrict built development, but which can potentially provide space for new connection infrastructure. In the vicinity of the Dunton Hills Garden Village proposals the 2023 preferred draft alignment has been amended to take forward a preference to follow the gas pipeline corridor for a greater distance (this is included in the 2024 preferred draft alignment).

5.4.9 National Grid has appointed an independent aviation consultancy to assist with the consideration of potential interactions with flying activities. Aviation interests identified have included a variety of aircraft types, hot air ballooning, military, civilian and emergency services helicopters, as well as model aircraft. Following engagement, and in response to feedback and further assessment, changes have been made to the 2023 preferred draft alignment.

5.4.10 The 2024 preferred draft alignment has been developed so that flight activities at all identified airstrips (where flight activity is confirmed) can continue to operate, with one exception. At Chase Farm airstrip the 2024 preferred draft alignment cannot be located at sufficient distance from the airstrip to achieve the required clearance from the overhead line. National Grid will continue to engage with the operator of Chase Farm airstrip to establish the appropriate response. We will also continue to engage with the other airfields as appropriate throughout the Project's continuing development.

5.4.11 In some locations the 400 kV infrastructure crosses or follows the alignment of existing UKPN owned/operated 132 kV overhead lines (on lattice pylons). We are proposing the replacement of sections of 132 kV overhead line with132 kV underground cables with final details subject to detailed design and agreement with UKPN.

5.4.12 Additionally, in response to feedback and as a result of assessment, a number of further areas have been identified where replacement of 132 kV overhead lines (on lattice pylon) with underground cable is proposed as mitigation for effects that would otherwise arise. In all cases these are extensions to the underground cable already required for crossings. We will continue to consider whether this may also be appropriate in other locations, and subject to agreement with UKPN.

Norwich Main Substation to Tas Valley – Section A

5.4.13 This is within Section A which extends from Norwich Main Substation to the River Waveney. Proposals for a battery storage facility have come forward on the south side of Norwich Main Substation which overlap with the 2023 preferred draft alignment in respect of the positioning of pylon RG004 and the span through to RG005 which are close to the existing overhead line (see Figure 5.1).

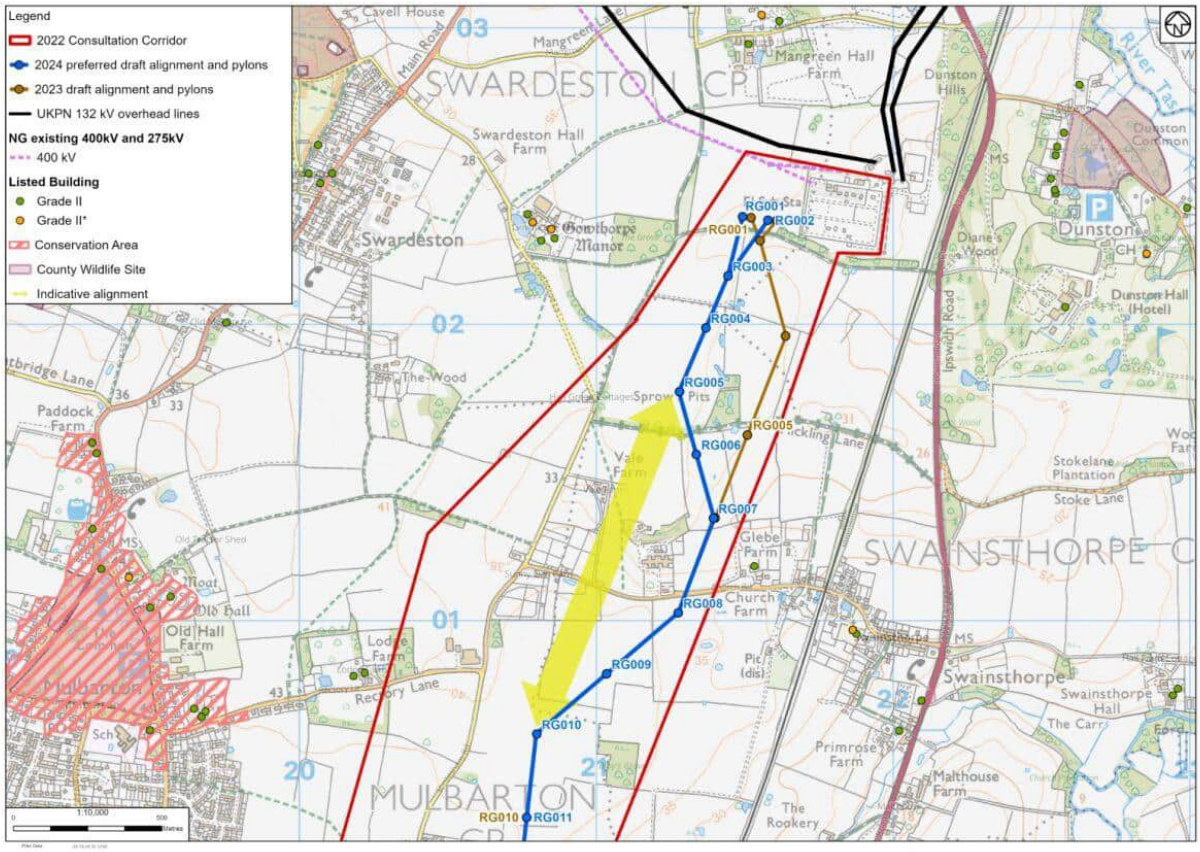
5.4.14 Consideration was given to repositioning the 2023 preferred draft alignment or influencing the potential layout of the battery storage should it be progressed. It was concluded that on balance, despite the introduction of an additional pylon, there would be overall lower effects due to better screening of the more extensive ground level battery infrastructure by Sprow's Pits Woodland if the proposed 400 kV overhead line was realigned. Pylons RG001 to RG007 (RG1 to RG6 in the 2023 preferred draft alignment) are now positioned to the west of Sprow's Pits Woodland.

5.4.15 The draft Order Limits[11] to the east allow for the 2023 preferred draft alignment to be taken forward, should for whatever reason the battery storage proposals not proceed, as this would be preferred in the absence of that development.

5.4.16 An alternative straight alignment (between pylons RG005 to RG010 on the 2024 preferred draft alignment) which would have positioned the alignment to the west of The Vale was less preferred. Whilst noting this would reduce the number of angle pylons and in some respects be more consistent with the Holford Rules, it would have resulted in a large number of residential properties (houses and apartments) being positioned closely between overhead lines to east and west, increasing effects on residential amenity and thus being less consistent with supplementary notes to the Holford Rules. It was considered that effects would be reduced by the 2024 preferred draft alignment passing to the same side as the existing overhead line.

[11] The draft Order Limits define the boundary of the area over which National Grid will seek permanent and temporary rights to undertake the necessary construction works and to deliver the Project

Figure 5.1 Alignment south of Norwich Main Substation

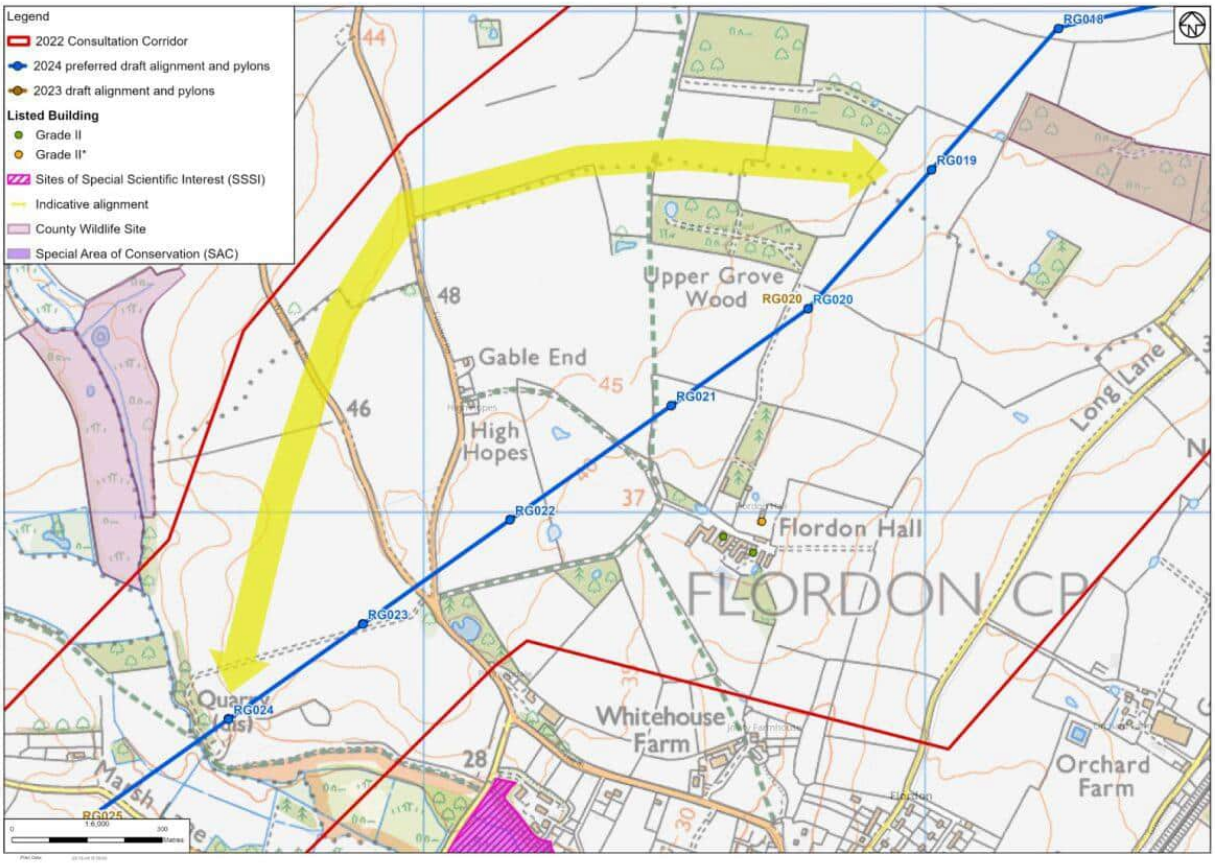


5.4.17 A minor realignment is being taken forward between RG013 to RG017 (referred to as RG12 to RG17 on the 2023 preferred draft alignment). This is in response to the repositioning of RG013 slightly northwards due to the presence of buried archaeological features (identified by surveys for the Bloys Solar Farm), and a consequent realignment of the route to the south, balancing the preference to avoid introducing an additional angle pylon but retaining the position of RG14 to minimise interaction with an existing solar farm.

5.4.18 Feedback requested moving the route further to the west of Flordon Hall (see Figure 5.2). This would be from around RG019, heading west between blocks of woodland and passing to the west of residential properties at and close to Gable End, before reconnecting in the vicinity of RG024.

5.4.19 Whilst this would potentially reduce effects on views from the east of the Grade II* Listed Flordon Hall it would require a longer route, three additional angle pylons and potentially an additional pylon compared with an otherwise substantially straight alignment. It would also partially transfer environmental effects to the Grade II* Listed Mergate Hall and position more pylons in closer views of several homes on Flordon Road. On balance, given the less direct and longer route, and the relative effects of the alternative to other similar receptors, no change is currently proposed, and the preferred alignment is the same as in 2023.

Figure 5.2 Alignment at Flordon

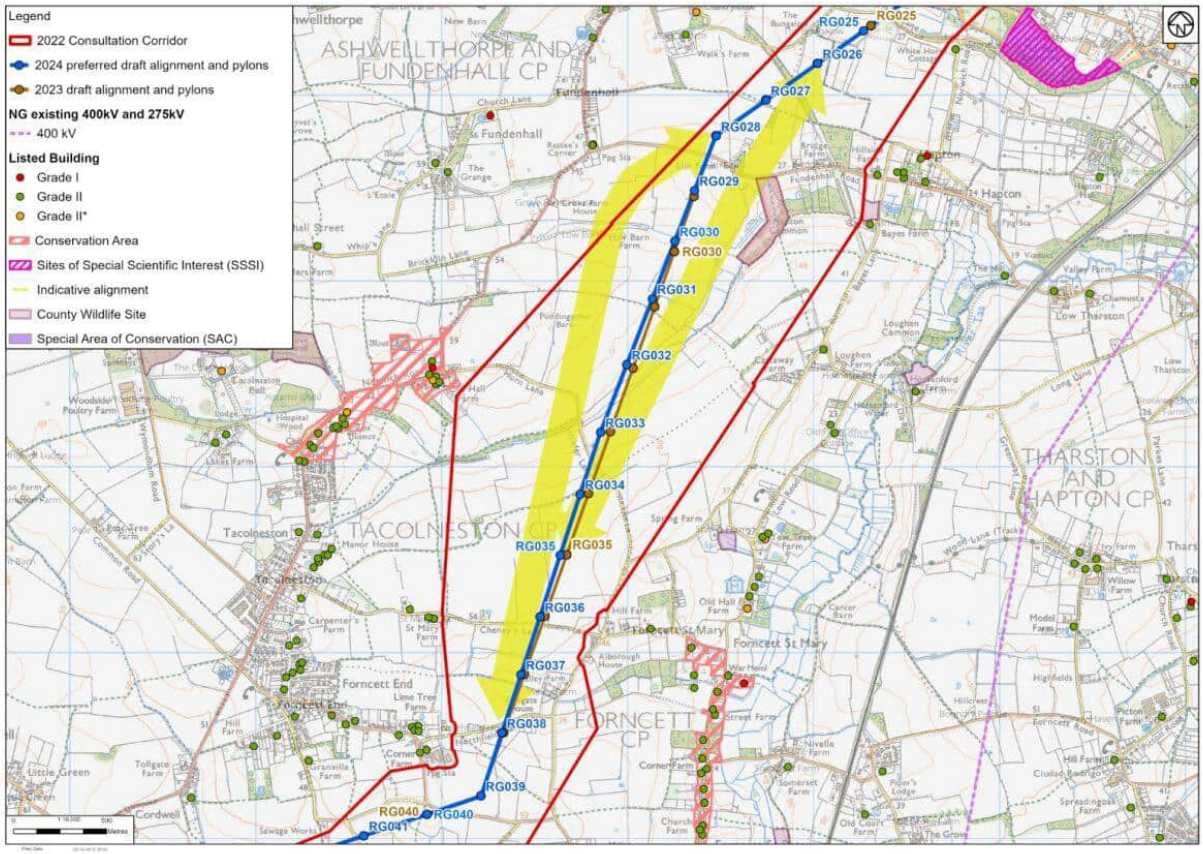


5.4.20 A slight realignment to the west has been made between RG028 to RG039 (see Figure 5.3) to respond to landowner feedback to position pylons to field boundaries, and to increase separation to South Norfolk Model Flying Club. The feedback requested moving pylons RG028 / RG029 to the west, together with a straight realignment to the south towards RG038. This change would move RG037 much closer to a property where the 2023 preferred draft alignment was approximately midway between it and a property to the east. At this location the nearest pylon to one of the properties also benefits from being positioned behind existing trees to provide some screening.

5.4.21 Seeking to meet request for a separation from the model flying site in excess of 300 m by a more localised route, would not be possible without introduction of at least two additional angle pylons (to the south of RG033), and / or potentially increasing the extent of woodland clearance, or materially reducing the separation to residential properties either side of the alignment. The slight realignment proposed with the 2024 preferred draft alignment has increased the separation to the model flying club to around 200 m. National Grid will continue to engage with the model flying club to consider opportunities to further reduce effects but considers this separation will not restrict model flying.

5.4.22 Other landowner feedback in this area suggested straightening the 2023 preferred draft alignment between RG024 and RG032 to use a shallow valley to the east. Whilst this would slightly lower the position of the pylons in accordance with some of the Holford Rules, it would reduce consistency with other Rules. It would also, increase effects on residential amenity by passing closer to a greater number of properties, and would lead to some ecological effects on Hapton Common County Wildlife Site (CWS) (as vegetation management would be likely to be required). As such this was less preferred and not taken forward.

Figure 5.3 Alignment at Tacolneston



5.4.23 In response to feedback, the positions of pylons RG043 and RG044 have been modified to increase the extent to which they are at least partially filtered by existing vegetation in residential views from properties to the south (at around 250 m distance). Whilst this change does move pylon RG044 closer to other residential properties to the west (but at a similar distance) the pylon is now not considered to be in main views (though depending on exact viewing location on a property curtilage may be to the side of views or benefit from some screening). Other alternatives suggested to remove the pylons from the view of the property to the south, such as a change of the alignment to pass further north and to the west of Banyard's Hall. This change has been considered but effects would be transferred to a greater number of properties at Cordwell, increased for the residential properties at Banyard's Hall (grade II listed) and there would be increased effects on woodland. The route of the 2023 preferred draft alignment has therefore been retained but individual pylon positions have been modified.

Tas Valley crossing to North of Diss - Section A

5.4.24 This is within Section A which extends from Norwich Main substation to the River Waveney.

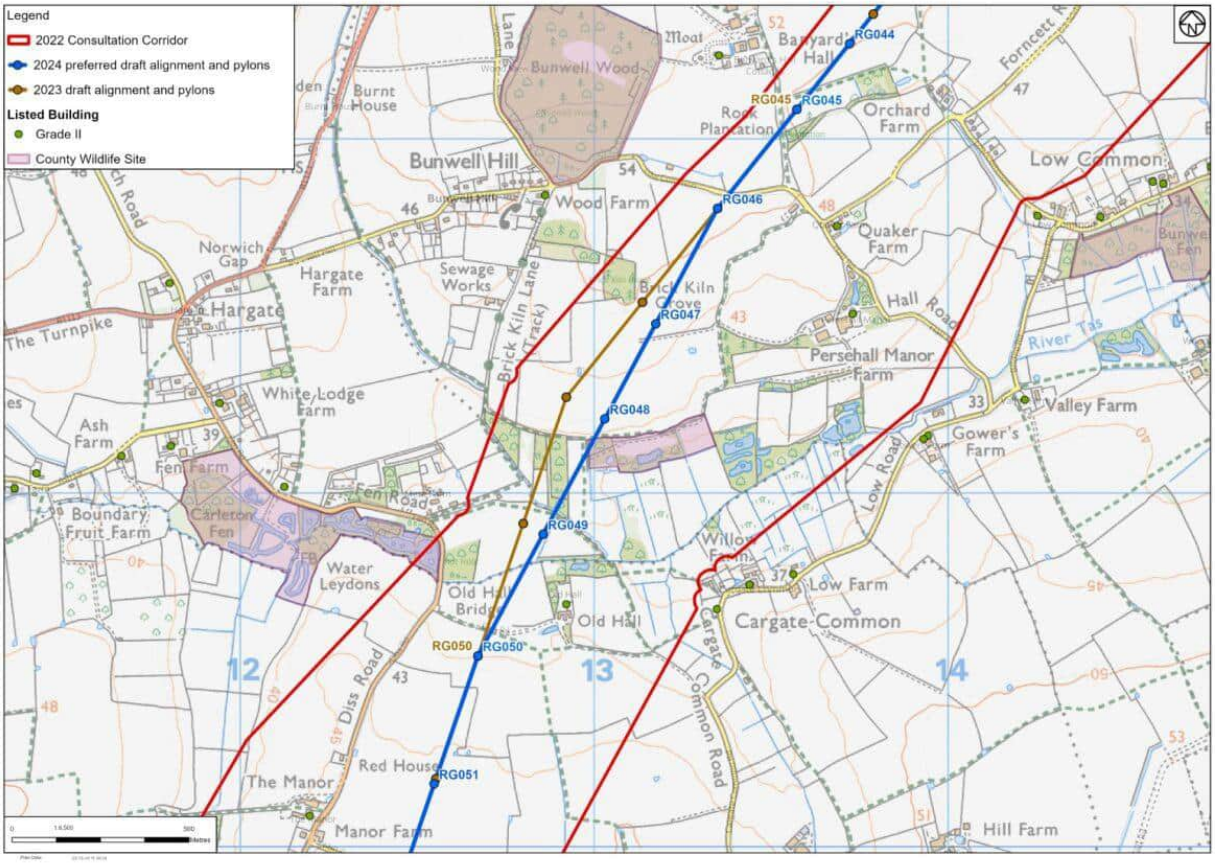
5.4.25 Feedback proposed moving the 2023 preferred draft alignment further to the west to reduce effects on Priory and Tibenham airfields. This has been reviewed, as set out in paragraphs 5.4.9 and 5.4.10 above, and it is considered that flight activities will be able to continue at both these airstrips.

5.4.26 The orientation of Priory Airfield parallel to the 2023 preferred draft alignment means aircraft can achieve necessary clearance. At around 2 km from the Project, flying activities at Tibenham Airfield are not considered to be affected. National Grid will however continue to engage with the relevant operators.

5.4.27 Other feedback in this location suggested alternative alignments should be adopted to the east between RG046 and RG050 (see Figure 5.4) to reduce effects on an area of woodland. An alternative, to divert directly south from the east of RG048 before a right angle turn to reconnect around RG050, was not taken forward due to the greater angle of direction change and potentially increased effects on the residential amenity, and heritage effects at Old Hall. This was change was also considered to be less consistent with the Holford Rules.

5.4.28 The 2024 preferred draft alignment does however include a realignment between RG046 and RG050 which was raised as a further alternative. This replaces a single larger direction change at RG048 with two smaller direction changes at RG046 and RG050. Both the 2023 preferred draft alignment and 2024 preferred draft alignment would affect existing woodland. Although the 2024 preferred draft alignment would oversail the western end of the Brick Kiln Lane Bunwell Hill County Wildlife Site (CWS) on balance ecology effects are considered lower on this alternative than on the 2023 preferred draft alignment and would not be offset by slightly closer routeing (reducing from just over 250 m to just under 250 m) to the Grade II listed heritage asset at Old Hall which benefits from some screening and filtering by existing vegetation.

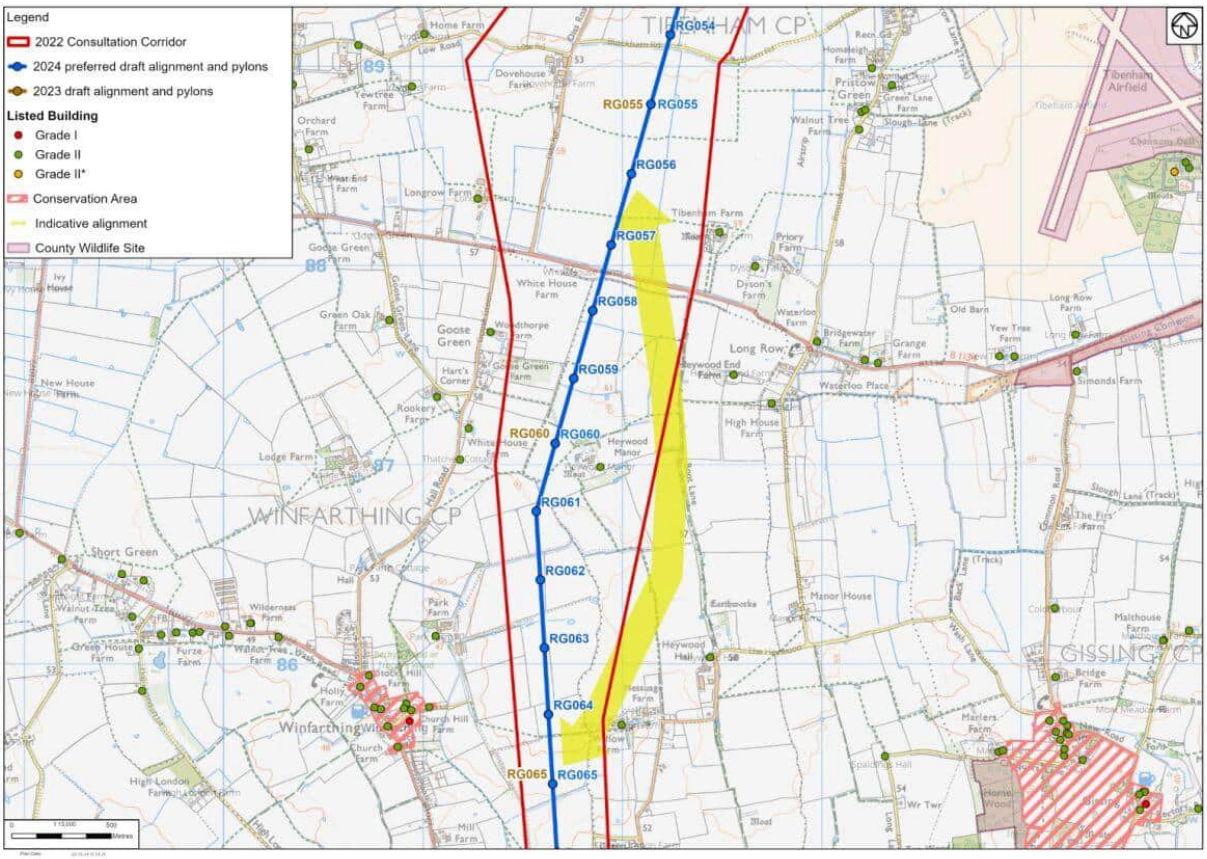
Figure 5.4 Alignment at Cargate Common



5.4.29 Feedback to position the alignment to the east of Heywood Manor to reduce effects on visual amenity to residents and businesses to the west of RG59 to RG61 has been considered (see Figure 5.5). There is around a 400 m separation between the properties and the 2023 preferred draft alignment. This potential change, without adding undue diversions, would introduce two additional angle pylons and move the alignment closer to properties to the east of Heywood Manor reducing separation to between 250 m and 350 m thus increasing effects on residential amenity. It would also position the overhead

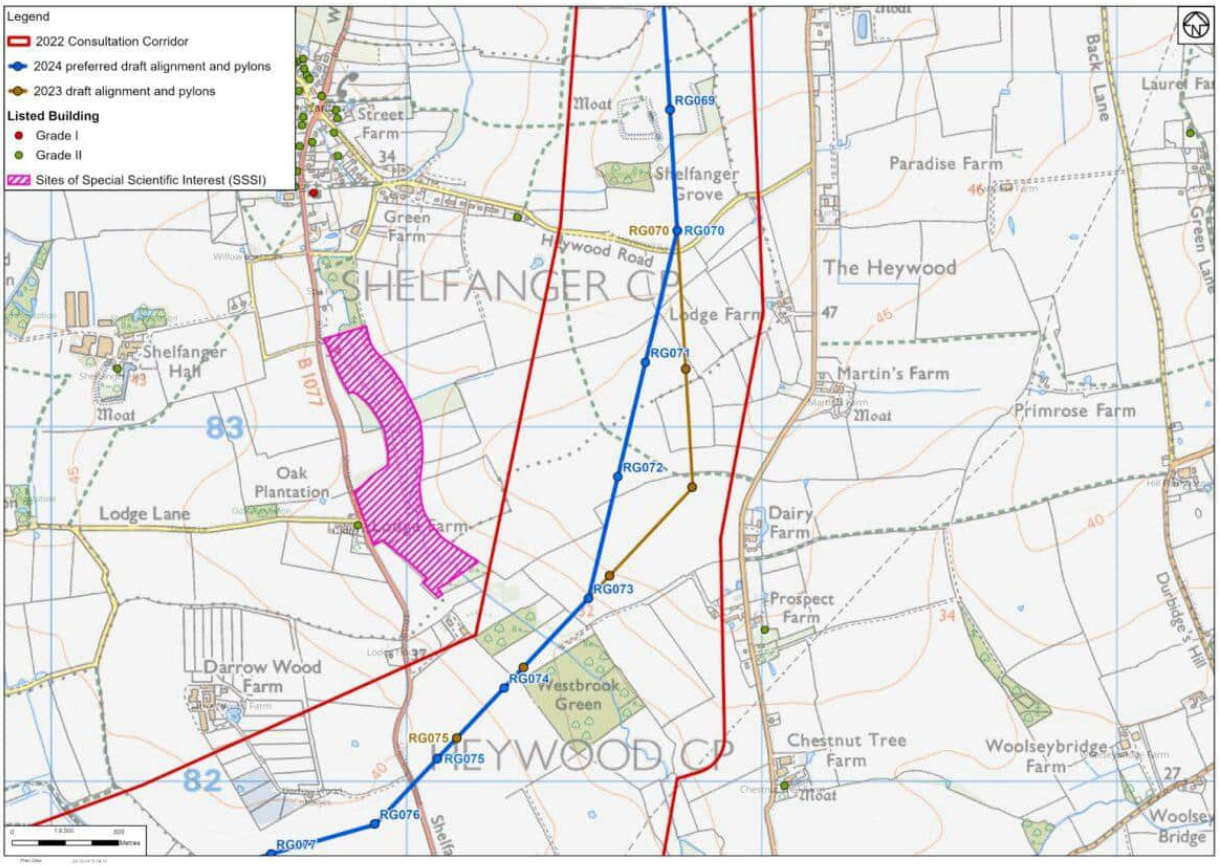
line closer to the southern end of Priory Airfield and likely to restrict flight activity. This alternative is therefore less preferred and has not been taken forward.

Figure 5.5 Alignment at Winfarthing



5.4.30 In response to feedback, a small adjustment to the 2023 preferred draft alignment between RG070 and RG073 has been taken forward (see Figure 5.6). Feedback had requested a diversion from RG069, but this has not been taken forward as it would have increased woodland loss (less consistent with the Holford Rules) and increased heritage effects due to oversailing a moat. The change can be made from RG070, requiring one angle pylon with a larger direction change to be replaced with two pylons each with a relatively smaller angle change. This reduces effects on residential amenity by increasing separation between the alignment and a number of homes to the east (including Lodge Farm and Dairy Farm) with the separation from the closest property increasing from around 150 m to around 300 m. For properties to the west, there is a slight reduction in separation, but this remains in excess of 400 m from the closest property. This change also allows for the adjustment of the position of RG074, moving it out of an ecologically more valuable river valley (from a field around 300 m from Shelfanger Meadows, just upstream in the valley) into an arable field.

Figure 5.6 Alignment at Shelfanger



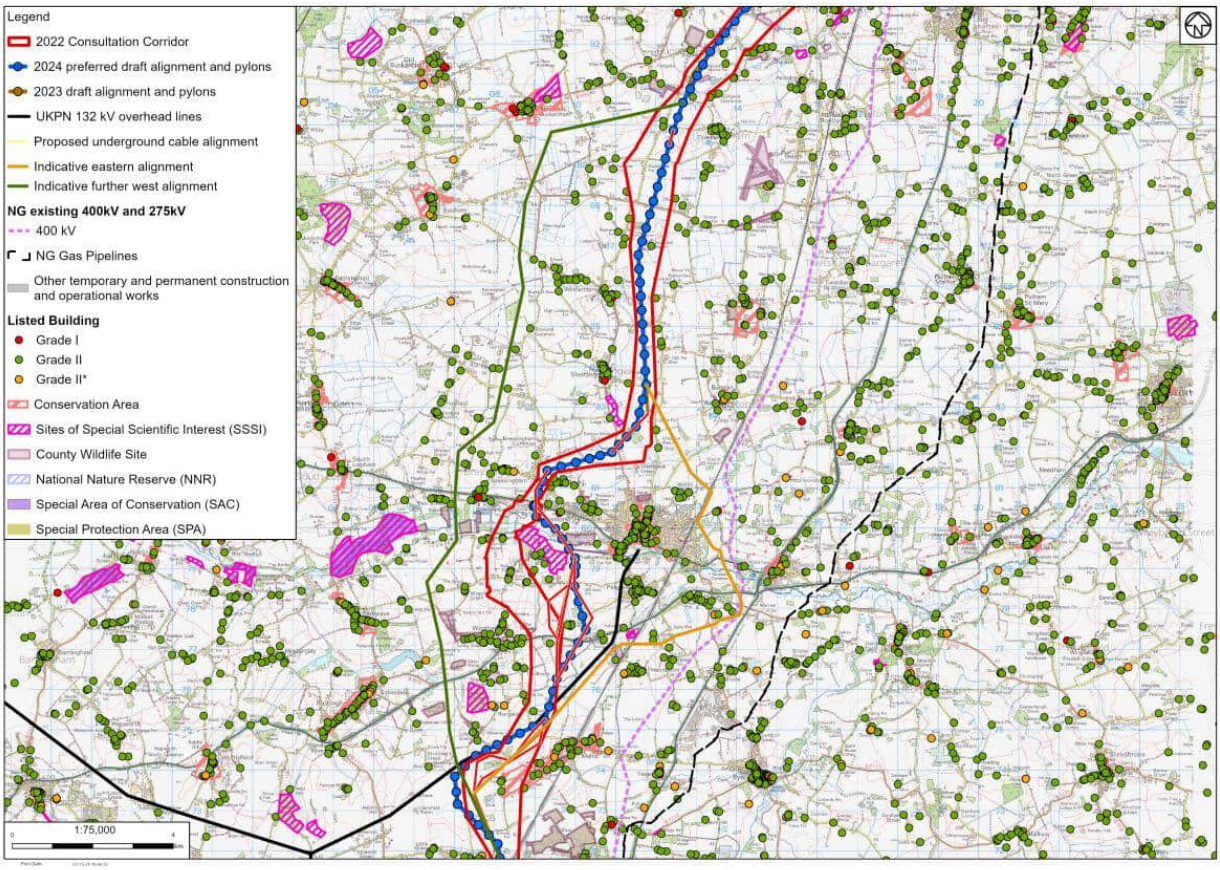
Diss and the Waveney Valley (including the Waveney Valley Alternative – Section A and Section B

5.4.31 The River Waveney forms the boundary between sections with section A to the north and section B to the south. Potential alternative alignments to pass further to the west of Diss, than the 2023 preferred draft alignment, as well as potential alternative alignments to pass to the east of Diss have been backchecked in response to restated preferences in feedback responses (see Figure 5.7).

5.4.32 Alternatives for overhead line only and overhead line with underground cable have been considered. For the option further west this was considered on the basis of a specific alignment that had been proposed but noting that this proposed route, which in some cases was close to residential properties, was refined by applying the same routeing approach adopted for the 2023 preferred draft alignment.

5.4.33 Alternatives further west as overhead line only are overall considered less preferred because they would lead to greater effects. For an overhead only alternative. A Grade I Listed Church (Church of St John the Baptist at Bressingham) would be passed at similar ground level around 550 m to the west (the 2023 preferred draft alignment passes a Grade I listed church on lower ground at around 400 m distance). Ecological effects are considered to be greater than for the 2023 preferred draft alignment due to closer proximity (approximately 1 km compared with approximately 3 km for the 2023 preferred draft alignment) to Redgrave and Lopham Fens (SSSI, Ramsar, National Nature Reserve, Special Area of Conservation). It would also route is through an area more central to nature recovery proposals that are being progressed.

Figure 5.7 Alignment at Diss



5.4.34 Alternatives further west would also lead to greater effects on peaty soils which are more extensive to the west when compared with the area crossed by the 2023 preferred draft alignment.

5.4.35 Whilst there is no prescribed guidance on the proximity of overhead lines to residential property, the effects on residential amenity are considered overall to be to be slightly reduced on the further west alternatives. When compared with the 2023 preferred draft alignment Ait there are slightly fewer residential properties within 200 m than are within the same distance of the 2023 preferred draft alignment (estimated at 18 compared with 25). There are however a greater number of clusters of residential properties from the 2023 preferred draft alignment (such as at Bressingham) than are present within a similar distance from alternative further west.

5.4.36 With effects reduced through filtering by existing vegetation and separations between residential property and the Project at distances greater than 200 m (e.g. 300 m at the northern and less screened properties at Bressingham Common) these potential effects on residential properties are not considered to outweigh the ecological concerns and potential effects on peaty soils on the alternatives further west.

5.4.37 An alternative further west including with a section of overhead line crossing the Waveney Valley being replaced by the use of underground cable was also considered. A slightly longer length of underground cable, compared with the Waveney Valley Alternative, would be necessary to position CSE compounds outside Flood Zones. Overall, this alternative is considered to be less preferred principally because of greater effects on ecological interests and peat. These effects arise because additional information indicates the area comprises a layer of peat/peaty soils over gravel which

presents limitations to the extent to which trenchless technology[12] can be used. This requires the use of open cut trenching over a distance around twice that of the Waveney Valley Alternative. There are also additional challenges to underground cable construction from relatively more extensive areas of woodland and the presence of a number of waterbodies making this alternative less preferred.

5.4.38 Alternatives to the east of Diss (whether as overhead line only or overhead line with underground cable) were also considered. Both these alternatives would offer better access for construction traffic compared with either the 2023 preferred draft alignment or the further west alternative, both of which require Heavy Goods Vehicles (HGV) movements through Diss on the A1066.

5.4.39 An overhead line only alternative to the east of Diss is not preferred to the 2023 preferred draft alignment. A route to the east of Diss would have the potential for effects on the Grade I Listed St Andrews Church at Frenze necessitating an alignment to the west of the church. Overall, this is also a longer route than alternatives to the west of the town. The routeing would also lead to effects on residential amenity to two to three times more properties compared with alternatives to the west of Diss. It also unavoidably positions several properties between overhead lines (close to both sides) at locations near Diss Business Centre and to the south of the A1066. A route across Stuston Common Golf Course would need to be identified with the potential for construction works to restrict activity over several parts of the course for extended periods. Additionally, the proximity of the existing 400 kV overhead line and residential properties (Stuston Hall and Lily Farm, both also Grade II listed buildings) to the south of the A143, means either around a 2 km section of underground cable between CSE compounds, to cross under and then back under the existing overhead line, or repositioning of the existing overhead line to the east to create additional space for the Project would be required. Given the increased effects on residential amenity, potential effects on the golf course, and the technical complexity, additional cost, and necessary outages to pass the existing overhead line, an overhead line alternative to the east of Diss is less preferred to the 2023 preferred draft alignment.

5.4.40 An alternative to the east of Diss (as overhead line with underground cable) has also been considered and is not preferred. Although many of the effects would be the same as for the overhead line only alternative to the east set out above, additional effects would also be expected.

5.4.41 The same ground conditions (peat over gravel) are expected in the vicinity of the river with similar restrictions on trenchless crossing length as noted above. As well as the effects arising from open trenching through peat, it is also expected to be more disruptive for a longer period to the activities of Stuston Common Golf Course. In addition, the underground cable length required to the east would be around 25% greater (from north of the A1066 to south of Stuston House) and there would be conflict with the need to safeguard Common Land given routeing through Common Land.

5.4.42 Feedback has also suggested a preference for reverting to an alignment within the 2022 consultation corridor, either as an overhead line only alternative or as overhead line with underground cable alternative. Respondents commented that effects on businesses

[12] Open cut trenches are the standard underground cable technique but can be replaced by the use of trenchless techniques (such as Horizontal Directional Drilling) to avoid or reduce effects on surface features. Factors such as topography, soil characteristics and other constraints influence the distance over which such techniques can be deployed.

should be given less weight than residents views. No additional factors or new material considerations were identified by feedback over and above respondent preference.

5.4.43 Route length for an alternative within the 2022 consultation corridor is expected to be comparable to that for the 2023 preferred draft alignment. We have back checked the previous decisions informed by new information and the updated planning policy position. It has been concluded that adopting an overhead line only alignment within the 2022 consultation corridor would reintroduce the effects identified previously, and that these continue to be of sufficient level to continue with the 2023 preferred draft alignment. These effects would be on the Grade I Listed St Mary's Church at Wortham, passed on higher ground, compared with the 2023 draft preferred alignment passing St Remegius on lower ground. It would reintroduce the likely oversail of parts of the Bressingham Steam Museum and Gardens (an important local socio-economic site), would oversail a recently consented care and well-being business and would increase the removal and thus effects on non-designated woodland. It would either require a less direct route with greater angles to avoid Brook Farm Airstrip or be likely to lead to closure of the airstrip due to the overhead line being unavoidably close with insufficient clearance for aircraft. For these reasons National Grid does not consider it appropriate to adopt an alignment within the 2022 consultation corridor.

5.4.44 Whilst some of these effects may be addressed by the inclusion of a section of underground cable this would be much longer than proposed for the Waveney Valley Alternative. This is because unlike the 2023 preferred draft alignment, where the church (in the 2023 alignment it is St Remegius) overlooks the valley, with the 2022 consultation corridor the church (in the 2022 corridor it is St Mary's) is located away from the valley. As a result, it would be expected to require a longer length of cable to address both concerns. It would also lead to greater loss of woodland in light of the restrictions on trenchless crossing distances noted above. Other effects such as on Brook Farm Airstrip would remain, as a reversion to overhead line would occur to the north of the airstrip. Reducing effects, as noted above, would require either a less direct route with greater angles to avoid Brook Farm Airstrip or be likely to lead to closure of the airstrip due to the overhead line being unavoidably close with insufficient clearance for aircraft. For these reasons it is not considered appropriate to adopt an alignment including some underground cables within the 2022 consultation corridor.

5.4.45 In summary National Grid considers that the 2023 preferred draft alignment is still preferred over other alternatives raised in feedback. It has therefore been taken forward as the baseline position for the 2024 preferred draft alignment.

5.4.46 Feedback to utilise underground cable as an alternative for part of the 2023 preferred draft alignment is considered in the section below.

Waveney Valley Alternative

5.4.47 National Grid develops its projects on the basis that as established by NPS EN-5 (paragraph 2.9.7) "it is the government's position that overhead lines should be the strong starting presumption for electricity networks developments in general...".

5.4.48 National Grid then follows the policy guidance as set out further on paragraph 2.9.20 "...this presumption is reversed when proposed developments will cross part of a nationally designated landscape ".

5.4.49 Further consideration is then given to other specific locations where, in line with policy set out in NPS EN-5 paragraph 2.9.23 "cases will arise – though no part of the proposed development crosses a designated landscape – a high potential for widespread adverse

landscape and/or visual impacts along certain sections of its route may result in recommendations to use undergrounding for relevant segments of the line...”

5.4.50 National Grid has considered this policy guidance and whether there are locations where the combination of circumstances presented by potential effects (including on landscape, heritage and recreational amenity) justify the additional costs and effects that would arise from the use of underground cables (NPS EN-5 2023 para 2.9.25 set out in the Secretary of State decision making considerations.). We have identified the crossing of the Waveney Valley as a specific location where the combination of effects may arise subject to the potential effects on ecology and soils.

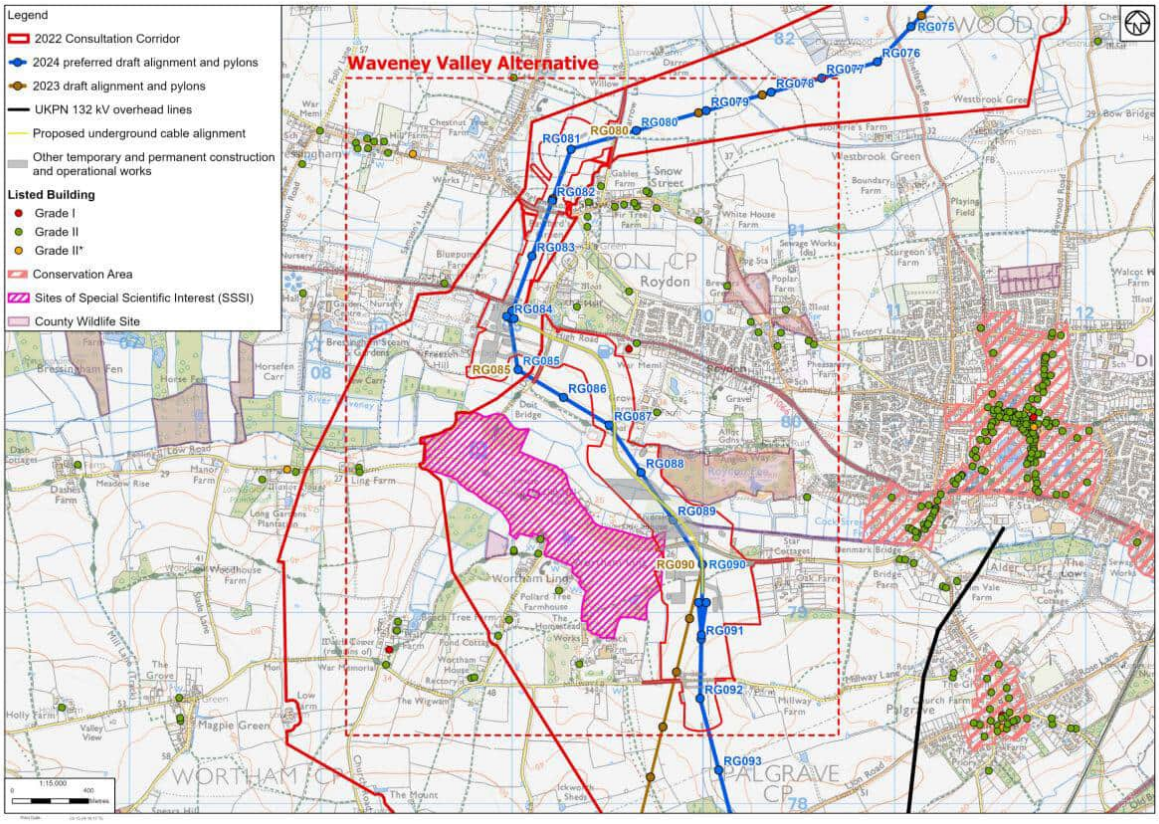
5.4.51 Whilst the Waveney Valley is not a nationally designated landscape as set out in NPS EN-5 paragraph 2.9.20, the area was formerly identified (in the local plan) as a Special Landscape Area. Effects would arise from new infrastructure in the landscape. In addition, the setting of a Grade I listed building (St Remegius Church) extends from the edge of Roydon across the valley to the agricultural hinterland and would be affected by a new overhead line. There would also be effects on an undesignated moat. The valley, including the adjacent SSSI are used extensively for recreation with a long-distance path the Angles Way (established by the Ramblers Association), crossed by the 2023 preferred draft alignment adjacent to RG087.

5.4.52 In considering whether the threshold implied by paragraph 2.9.23 is met, National Grid has developed a proposed arrangement, referred to as the Waveney Valley Alternative, for a connection incorporating some underground cable (see Figure 5.8). This shows both the alignment and pylon positions if progressed as overhead line along with the route of the underground cable in the Waveney Valley Alternative arrangement. In this alternative arrangement, which is proposed to comprise of an approximately 2 km section of underground cable with CSE compounds adjacent to RG84 (just to the south of the A1066) and to the north of RG91.

5.4.53 Initial consideration of the design of the underground cable section for the Waveney Valley Alternative identified that the central part of the valley, around the River Waveney, includes areas of peat. Given the sensitivity of such habitats the potential use of trenchless techniques (such as Horizontal Directional Drilling (HDD)) was proposed to be adopted with potential to cross the approximately 700 m extent of peat (noting that the 2023 preferred draft alignment crosses at the narrowest part). Subsequently, a review of available ground condition information suggests conditions comprise peat/peaty soils over sand and gravel. These specific ground conditions are considered likely to restrict the achievable distance for HDD to around 150 m from an excavated drive pit. Given this, it has been assumed that two HDD sections (each centred approximately on each of two main river channels) would need to be installed with the remainder of the underground cable being installed by open cut techniques. There would still be the option for trenchless installation across the full 700 m of peat / flood zone pending ground investigation results and further design.

5.4.54 There would be potential benefits of a section of underground cable in terms of landscape effects. A limited number of residential properties would also benefit from reduced effects on residential amenity in views from a small number of properties along the A1066 with views to the south over the valley.

Figure 5.8 Alignment for Waveney Valley Alternative



5.4.55 Effects on the setting of the Grade I listed church will be avoided (by the absence of pylons). There may however be increased effects on archaeological resource (paleo-environmental and buried remains due to the proximity of the moat) and there would be increased effects on the peat soils as a result of the construction disturbance.

5.4.56 There would be increased tree removal (above the open cut trenching section) and increased effects on ecological interests compared with the overhead line alternative. Effects on recreational amenity (after the construction period) would be avoided (by the absence of pylons).

5.4.57 National Grid is continuing to gather feedback and are undertaking further assessments to inform the final decision making in this area to either remain with the baseline overhead line proposals as per the 2023 preferred draft alignment or to take forward the Waveney Valley Alternative comprising around 2 km of underground cable between RG084 and RG091.

5.4.58 Feedback has suggested the use of underground cable should be considered in the section to the north of the A1066 (raised by residents in Roydon and Bressingham to reduce effects on residential amenity). However, given the presence of some filtering of views by existing vegetation and the distance between properties and the 2023 preferred draft alignment, National Grid does not consider that the level of effects justifies the substantial additional costs and effects arising from a change to underground cable technology north of the A1066.

Wortham to Gislingham – Section B

5.4.59 Immediately south of the Waveney Valley a further change has been made to the 2023 preferred draft alignment. This is in response to feedback on the potential effects on flight activities at the Brook Airstrip, located to the west of RG099, and feedback about potential interaction with solar farm proposals (see Figure 5.9).

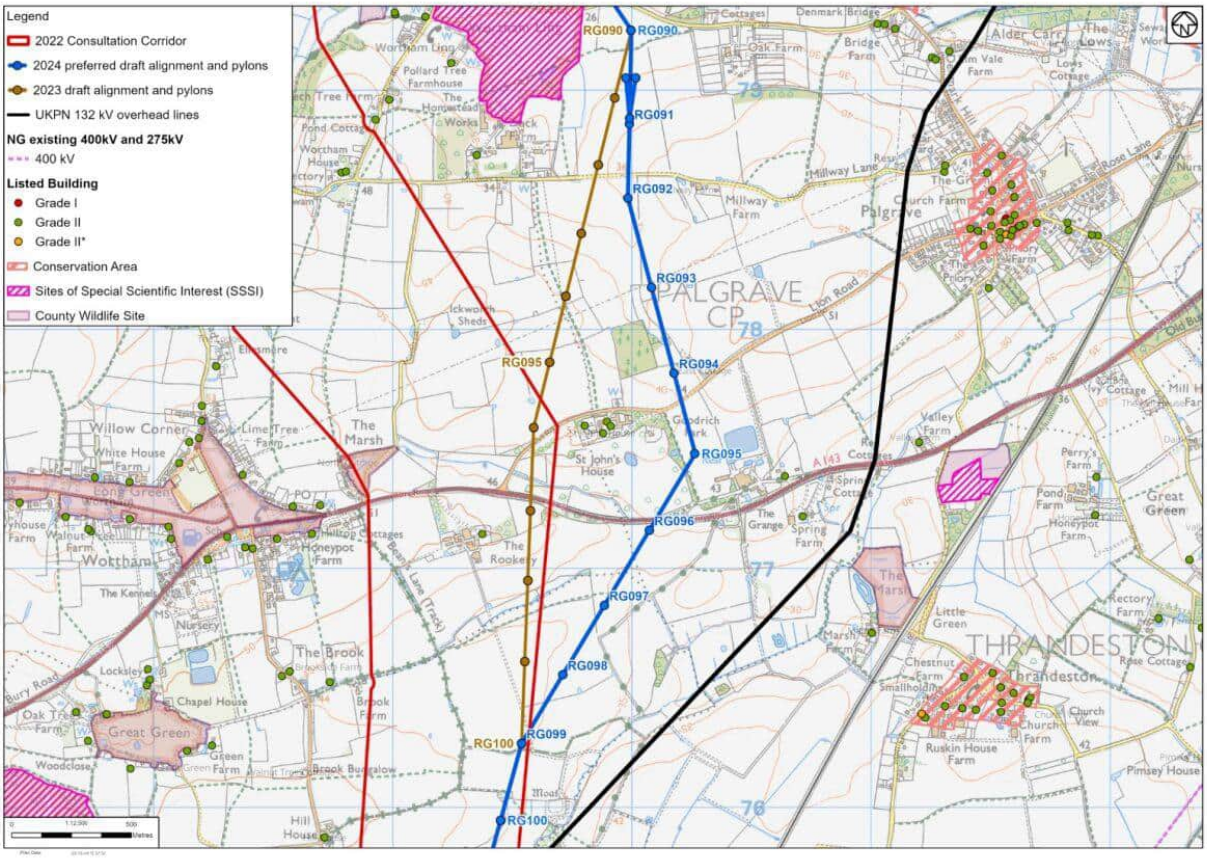
5.4.60 NPS EN-1 notes at paragraph 5.5.5 'UK airspace is important for both civilian and military aviation interests. It is essential that new energy infrastructure is developed collaboratively alongside aerodromes, aircraft, air systems and airspace so that safety, operations, and capabilities are not adversely affected by new energy infrastructure. Likewise, it is essential that aerodromes, aircraft, air systems and airspace operators work collaboratively with energy infrastructure developers essential for net zero. Aerodromes can have important economic and social benefits, particularly at the regional and local level, but their needs must be balanced with the urgent need for new energy developments, which bring about a wide range of social, economic, and environmental benefits.

5.4.61 After engagement with the airstrip operator, it was considered that if the Project remained on the 2023 preferred draft alignment there would be a need to terminate flying activities at the Brook airstrip as appropriate clearances could not be achieved with available pylon designs (the use of low height designs does not achieve the necessary clearance).

5.4.62 After further consideration it was concluded that achieving an alignment that supported the continuation of flight activities required a deviation to the east of the 2023 preferred draft alignment. Deviations to the west were constrained by the extent of residential properties at Wortham which would have required necessitating a deviation directly west around RG092 towards Magpie Green before a deviation to the south passing the west side of Wortham and reconnecting around RG110 to the west of Mellis. This less direct alternative alignment would be almost 2 km longer than the 2024 preferred draft alignment, with large direction changes less consistent with the Holford Rules and a transfer of effects to other receptors. This was therefore not preferred.

5.4.63 The 2024 preferred draft alignment deviates through a different solar farm development than the 2023 preferred draft alignment. This alternative further to the east would transfer effects from one planned solar farm development to another, though subject to final design of the solar farm and the overhead line alignment, the more eastern alignment would reduce the interaction with solar panels from three pylons (on the 2023 preferred draft alignment) to one (2024 preferred draft alignment). This alternative also changes the effects on residential amenity at a number of residential properties. On balance the effects are transferred from Rookery Farm and those near Duck Farm to East Cottage and The Grange. In the case of The Rookery and The Grange, pylons are screened from the properties to some extent, by farm buildings. For those near Duck Farm and East Cottage pylons have been positioned with some limited intervening filtering by trees. On balance with slight reduction in interaction with planned solar development and a transfer of residential effects it was considered that the change to allow continued flight activities was preferred to the closure of the airstrip. Ongoing assessment and feedback will continue to inform decision making around the need for the mitigation of cumulative effects with the 132 kV overhead lattice infrastructure located to the east and connecting to an existing 132 kV substation to the south of Diss operated by the local Distribution Network Operator.

Figure 5.9 Alignment at Wortham



5.4.64 Around Mellis, consideration has been given to feedback proposing various changes to move the 2023 preferred draft alignment further north and west. The reasons given in the feedback refer to effects on heritage features (including views from the conservation area, setting of various listed buildings and the setting of various moats) as well as to effects on residential amenity and effects on land management (i.e. moving pylons to field boundaries).

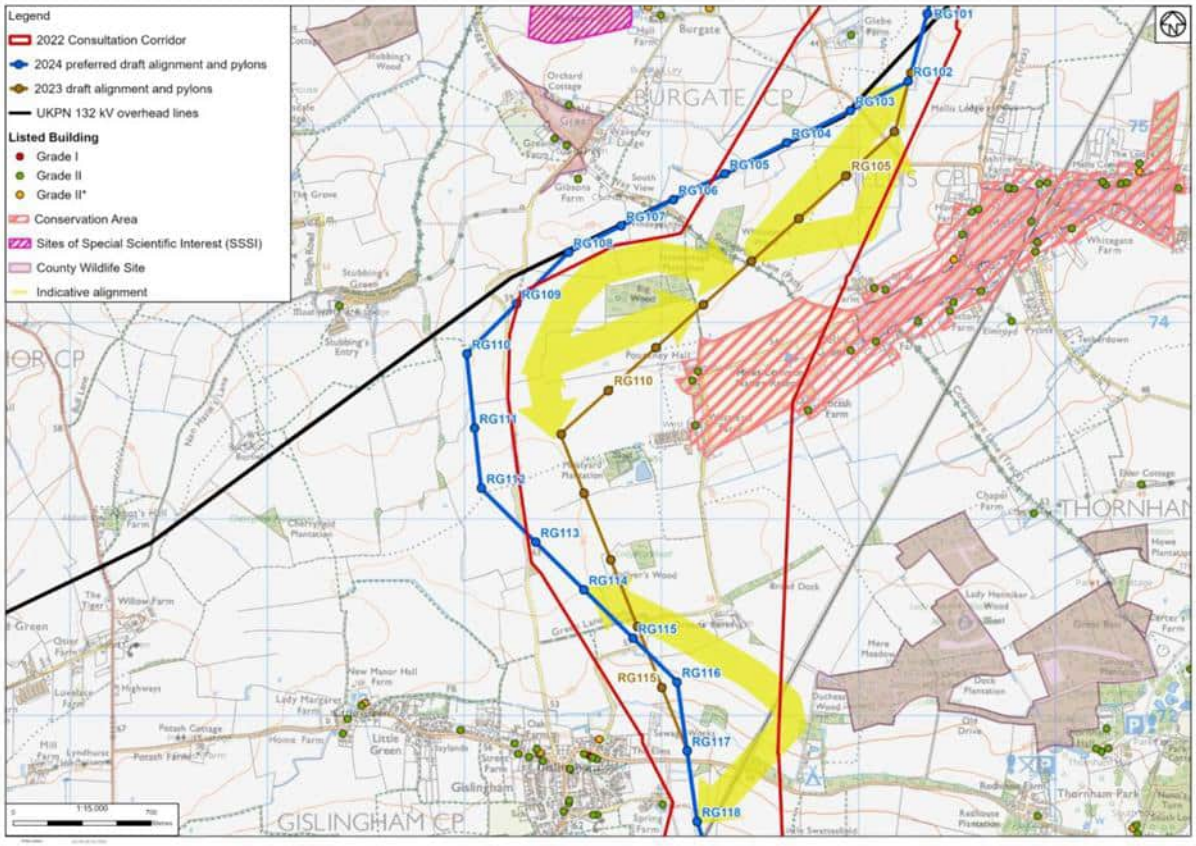
5.4.65 In response to feedback localised changes that moved the 2023 preferred draft alignment further from Mellis, albeit remaining on the Mellis side of Big Wood and Stonebridge Plantation, were considered (see Figure 5.10). Such a change can only be achieved by introducing additional angle pylons and moving from an otherwise straight alignment. Whilst noting some slight reduction in effects by slightly increased distance to pylons, it was not possible to meet all requests to position pylons on field boundaries or corners. Overall, it was considered that the benefits would also be substantially offset by the greater visual effects arising from the additional angle pylons required (typically at least 3 additional angles to address the requests). On this basis the suggested changes were less preferred and have therefore not been taken forward.

5.4.66 National Grid also considered an option proposed in feedback to route between Big Wood and Stonebridge Plantation to reduce effects on residential properties in the vicinity of Pountney Hall. Whilst noting the reduction of effects to receptors around Pountney Hall, making this change would require additional angles and potentially two additional pylons. On balance it was considered that the level of effect experienced at these properties would not justify the additional infrastructure and subsequent costs.

5.4.67 Feedback from Historic England provided new information on heritage assets and identified that the undesignated moat around 200 m east of the 2023 preferred draft

alignment (RG111 & RG112) was considered to be of equivalent to schedulable value. Increasing the separation between the moat and the alignment was considered necessary to avoid unacceptable effects on the setting and required the 2023 preferred draft alignment to move to the west towards or just beyond Burgate Road. In considering how this could be achieved an alternative was identified with the potential to address several elements of feedback identified above. This alternative would replace the existing 132 kV overhead line with an underground cable between rebuilt cable sealing end platform pylons and then utilise the former 132 kV overhead line alignment for the 400 kV overhead line. This would deviate from the 2023 preferred draft alignment from RG115 respectively on the 2024 preferred draft alignment). Whilst this would require works to the 132 kV network, a section of the existing 132 kV overhead line has to be replaced by underground cable in any case for the 2023 preferred draft alignment as it would be crossed by the Project. Extending the length of undergrounding for the alternative can be achieved relatively efficiently.

Figure 5.10 Alignment at Mellis



5.4.68 It is recognised that there would be an increased level of effect on residential amenity for those residential properties close to the existing 132 kV overhead line (including Church View, South View and Windeye) as a result of its replacement by taller 400 kV pylons. Replacing 132 kV lattice pylons with 400 kV lattice pylons would however result in a reduced magnitude of change overall when the much lower effects experienced by those properties in Mellis with views to the north-west is considered. This change would also reduce effects on views from the Mellis Conservation Area would more generally increase the separation between the unscheduled moat and the 2024 preferred draft alignment (from around 200 m for the 2023 preferred draft alignment) to around 600 m for the 2024 preferred draft alignment).

5.4.69 Whilst it is not possible to position all pylons on field boundaries the use of the 132 kV alignment does mean that there is relatively little change to the total number of pylons affecting agricultural operations. This compares with twice the number that would be required for the 2023 preferred draft alignment.

5.4.70 Taking all of this into account it is considered that the alternative is preferred, and it has therefore been taken forward in the 2024 preferred draft alignment.

5.4.71 To the south of Mellis respondents repeated previous feedback for a preference to position the crossing of the railway near to Gislingham (RG118 in the 2023 preferred draft alignment) further to the north. In the absence of further information on any material considerations or additional factors, it was considered that the rationale for theposition of RG118 remains valid.

5.4.72 In summary a crossing north of the road / railway line would be a less direct alternative and would require a large angle pylon at approx. 150 m distance to a number of residential properties and a campsite. A crossing point to the south would also require a large angle pylon at approximately 150 m distance, but to fewer residential properties, with the closest property (Grade II Listed Spring Farm) benefitting from greater filtering of views by existing vegetation. The more northern crossing point would also unavoidably route through undesignated woodland adjacent to the road (immediately east of the railway). On balance therefore a crossing of the railway to the south of the road remains preferred and no change to the Project is currently proposed at this location.

5.4.73 As shown on Figure 5.10 there has been some slight modification to the 2023 preferred draft alignment to the north of the rail crossing. By changing RG117 to a suspension pylon and moving the angle pylon further north, the separation to residential properties at the north-east of the village is increased.

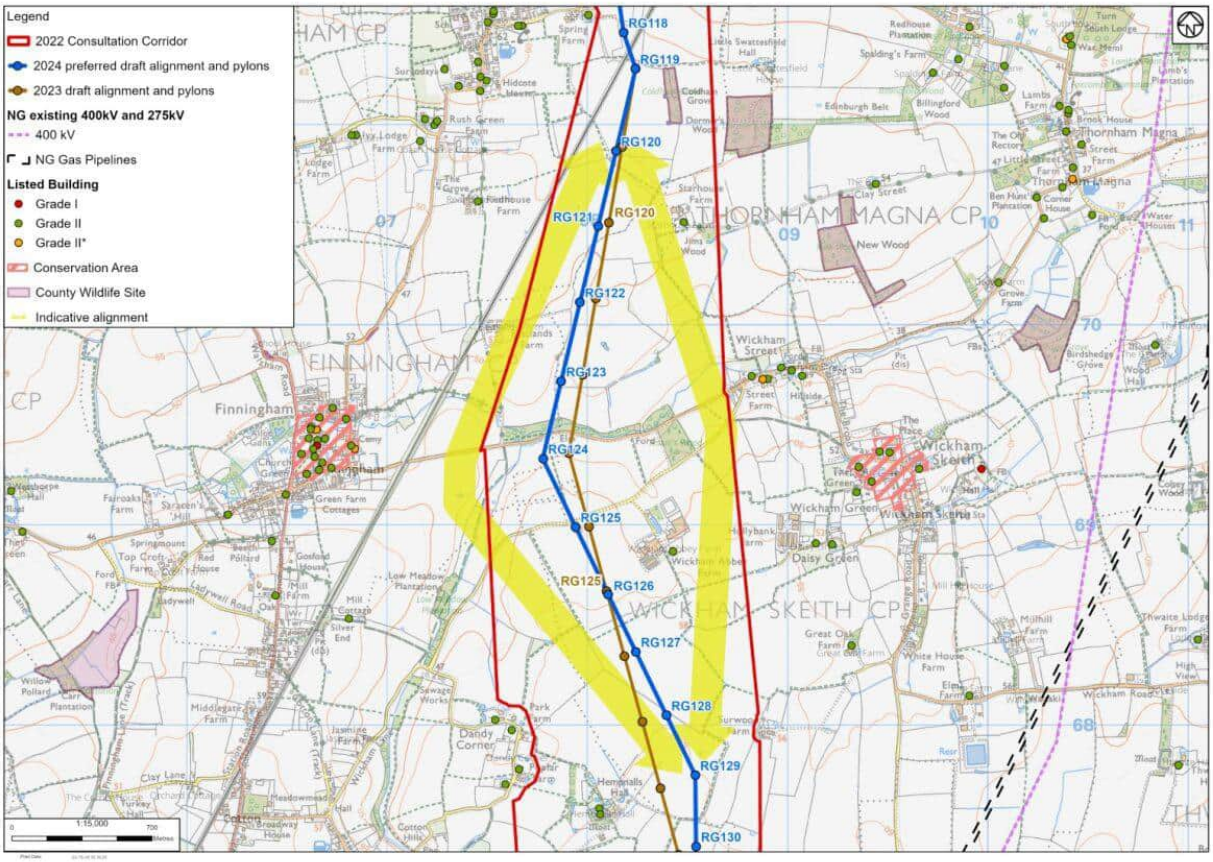
Gislingham to Mendlesham – Section B

5.4.74 Feedback from landowners requested that the alignment followed field boundaries or for pylons to be positioned at field boundaries. Other feedback also stated a preference to move the 2023 preferred draft alignment further to the east to reduce effects on heritage assets and on residential views for various properties at or near to Hempnalls Hall.

5.4.75 By slightly increasing the angles of direction changes and moving the angle pylon RG123 (which becomes RG124 in the 2024 preferred draft alignment) to the west and moving the angle at RG130 (2023 preferred draft alignment) to the north to RG129 (2024 preferred draft alignment) landowner preferences can at least partly be met RG122 and RG123 on the 2023 preferred draft alignment would move to field boundaries) (see Figure 5.11). Separation to Hempnalls Hall can also be increased without materially increasing effects on receptors to which the alignment has moved marginally closer. These minor adjustments to the west of Wickham Skeith have been included in the 2024 preferred draft alignment.

5.4.76 Other feedback requested moving RG123 (RG124 in the 2024 preferred draft alignment) further to the west to reduce effects on woodland. Whilst noting the potential for retention of a number of mature trees, this would only be achieved by moving the alignment to the west, closer to Eastlands Farm. Separation to this residential property would be reduced to under 100 m to avoid the area of woodland compared with around 300 m for the 2023 preferred draft alignment). There would also be a potential oversail of the menage area which would need to be mitigated. On balance retaining the 2023 preferred draft alignment at this location was preferred to avoid this transfer of effects to Eastlands Farm.

Figure 5.11 Alignment at Wickham Street

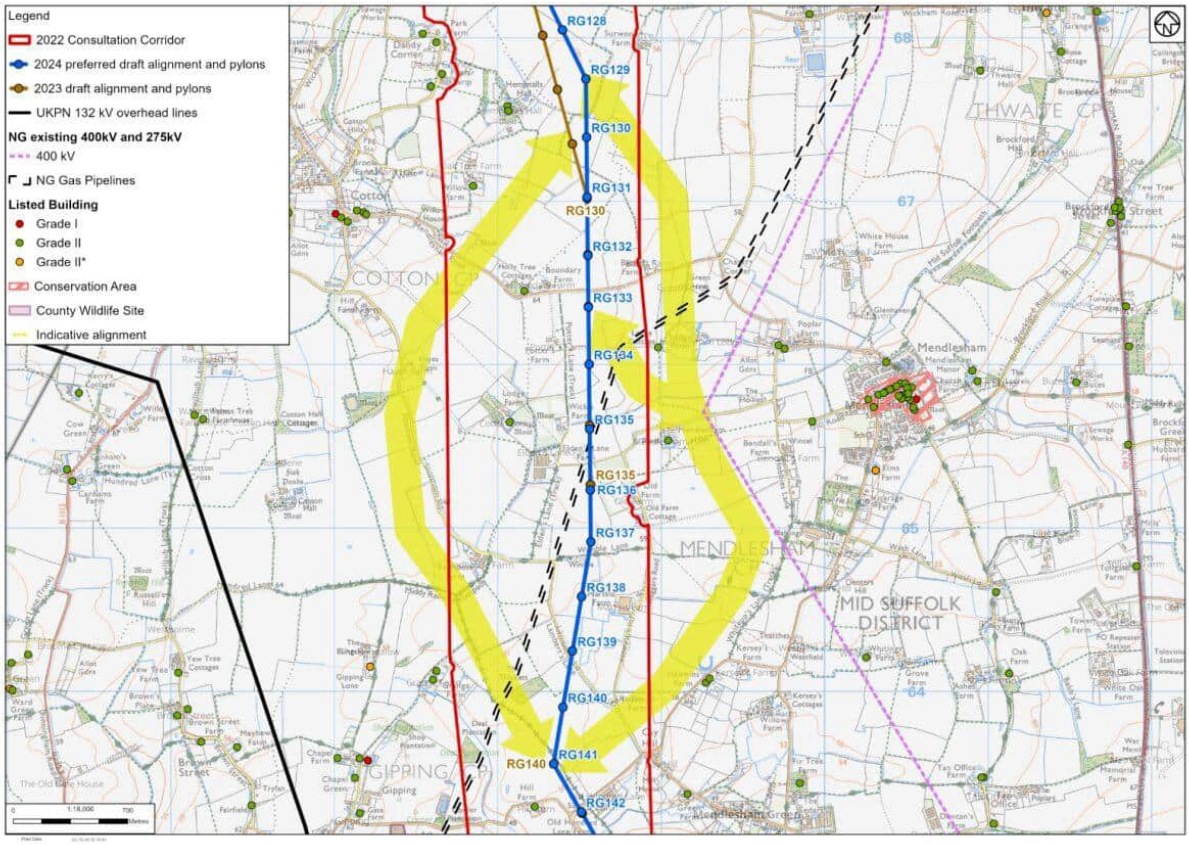


5.4.77 Where the Project converges to within about 700 m of the existing 400 kV overhead line between Norwich and Bramford, feedback was received that restated a preference for variations on route alignment to the west of Mendlesham. Feedback also proposed new alternatives (see Figure 5.12). It is to be noted that the 2023 preferred draft is straight at this location, and it is the existing 400 kV overhead line that deviates substantially to route past the west side of Mendlesham, leading to the overhead lines converging to around 700 m separation.

5.4.78 Some alternatives suggested in feedback sought to increase the separation between the proposed and existing 400 kV overhead line. It is considered however that these alternatives would transfer rather than reduce effects and therefore the more direct and straighter 2023 preferred draft alignment remains preferred in this location. Other alternatives proposed would have achieved a degree of paralleling but were less preferred as they lead to increased effects on heritage assets.

5.4.79 Other alternatives raised in feedback in the vicinity of Mendlesham sought to reduce overall effects by paralleling the existing 400 kV overhead line. However, these alternatives were considered to increase visual and residential amenity effects by either placing more residential properties closely between the existing and proposed overhead lines or would generally have required alignments to be positioned in much closer proximity to properties in order to avoid positioning residential properties with overhead lines close to both sides. On balance it was considered that the 2024 preferred draft alignment in the vicinity of Mendlesham remains unchanged from the 2023 draft alignment.

Figure 5.12 Alignment at Mendlesham



Mendlesham to Offton – Section B

5.4.80 A feedback request to position the alignment around RG144 to the east of a residential property (by an alignment between RG137 (2024) and RG 146 (2024) which potentially removes one angle pylon) to reduce effects on residential amenity was considered but was not preferred. It was concluded that it would transfer and increase residential amenity effects to several other residential properties to the west side of Mendlesham Green, more than offsetting the benefits gained to the individual property. Pylons (RG143 and RG144 (2024 preferred draft alignment) have however been moved to be approximately equidistant to either side of the straight driveway to slightly reduce effects.

5.4.81 Other feedback restated a preference for an alignment to be routed to the west of Saxham Street. The absence of a route to pass between properties to the east of Stowupland, as set out in the 2023 Design Development Report, remains the main restriction and has been further compounded by a recent planning application for light industrial buildings to the north of Stowupland Hall. As such no viable alternative has been identified to the 2023 preferred draft alignment.

5.4.82 Feedback identifying various landowner preferences has been considered as well as feedback on effects on residential amenity. This has resulted in a series of interlinked changes to the 2023 preferred draft alignment between RG145 to RG161 (now identified as RG146 to RG162 in the 2024 preferred draft alignment) being taken forward.

5.4.83 Feedback identified a landowner preference to move RG147 (now RG148 in the 2024 preferred draft alignment) to the east to position it within a grass field rather than within a narrow arable field. This change would require an additional angle pylon and a slight deviation from a straight alignment. This would reduce consistency with some of the Holford Rules whilst increasing consistency with other Holford Rules by allowing for

slightly increased separation to be achieved to various residential properties (a number of which are listed buildings) at Saxham Street. This would reduce effects on both residential amenity and on the heritage assets. This change would also reduce separation from the nearest pylon to a listed residential property (Grade II Listed Doles Farmhouse at Owls Farm (from around 200 m to around 150 m) but with some intervening vegetation and farm buildings to partially filter and screen potential views. On balance the change is considered preferable and is included in the 2024 preferred draft alignment (see Figure 5.13).

5.4.84 Other feedback requested the positioning of pylons within a proposed solar farm (east of RG150), but this has not been taken forward. This change would have required, additional changes of direction requiring additional angle pylons and would have been less direct and therefore less consistent with Holford Rules. Whilst noting this was perceived to reduce impact on agricultural productivity by using land already proposed to be taken out of agricultural production, overall, the area of clearance required around a pylon base for construction and maintenance activities was considered to be more impactful on solar farm productivity than would be the case if pylons were positioned within arable or grazing land uses. as such the alternative was less preferred and not included in the 2024 preferred draft alignment.

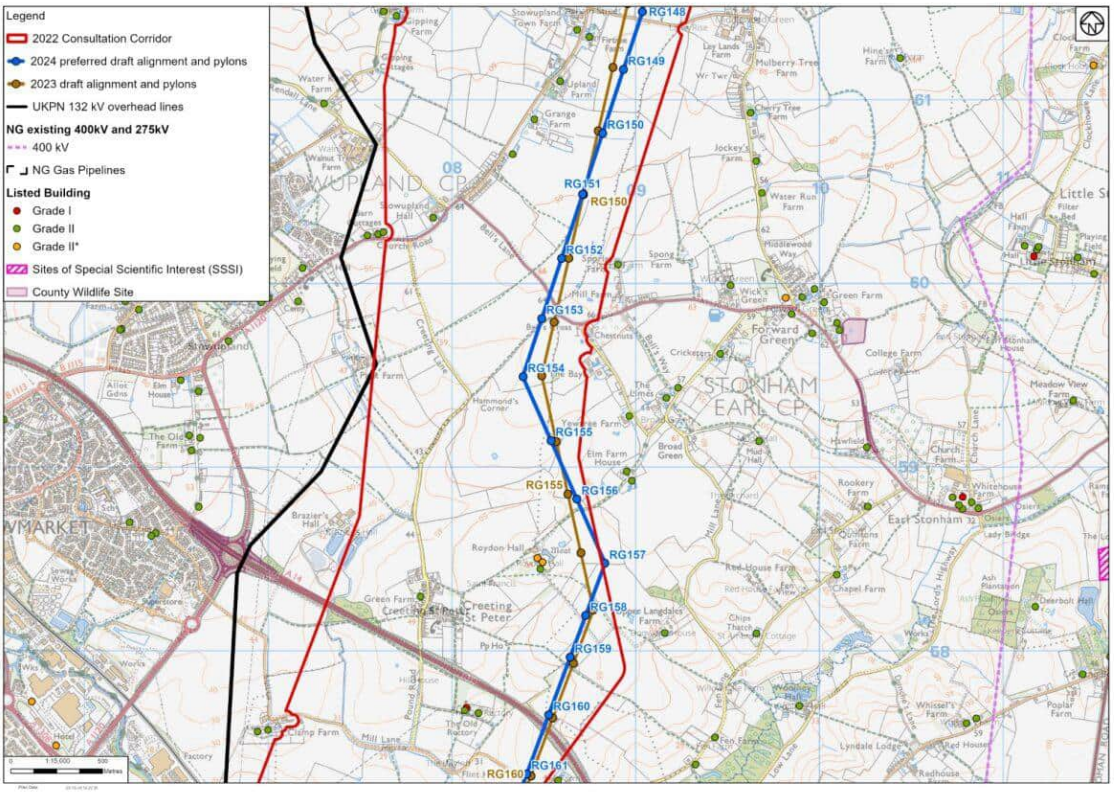
5.4.85 Feedback also suggested moving the alignment south to reduce effects on residential amenity and on Grade II* listed heritage assets. Considered individually, this would have required a number of additional angle pylons and would have been less consistent with the Holford Rules. However, an alternative arrangement was identified (see Figure 5.13) that slightly modified the degree of angle change and position of angle changes along the 2023 preferred draft alignment but did not require any additional angle pylons. This alternative arrangement reduced effects on residential amenity and reduced effects on two Grade II* listed heritage assets without increasing effects on other potential receptors. This alternative arrangement moved RG153 alignment) around 100 m west and RG156 (both in the 2023 preferred draft alignment) around 150 m to the east also changing it to an angle and the pylon to the south to a suspension pylon. In light of the reduction in effects, this change was preferred and taken forward in the 2024 preferred draft alignment (as RG154 and RG157 respectively).

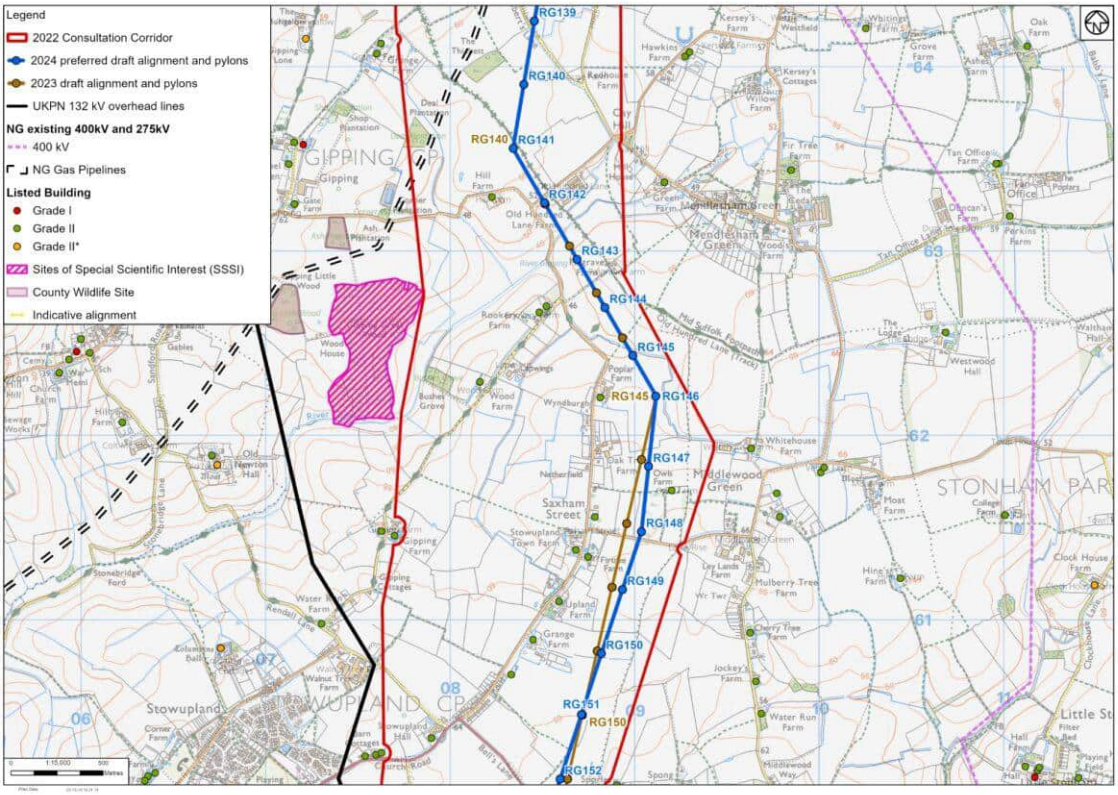
5.4.86 Feedback responses that reiterated previous requests and preferences to cross the A14 around the A140 junction, or to cross on or close to the alignment of the existing 132 kV overhead line near Stowupland have been reviewed. No additional factors nor new material considerations have been identified that would invalidate previous decision making. Alternatives close to the existing 132 kV overhead line are constrained by the Gateway 14 development and would have to pass close to the west of Creeting St Peter. Whilst partly benefitting from following a shallow valley, such an alternative would lead to greater effects on residential amenity for properties in Creeting St Peter that have open views to the west. Crossing closer to the A140 junction can only be achieved by close paralleling the existing 400 kV overhead line, which cannot be achieved for reasons set out from paragraph 5.3.12 of this document.

5.4.87 National Grid have engaged with Wattisham Flying Station to understand potential interactions with their activities. As set out in the 2023 Design Development Report, the 2023 preferred draft alignment is considered to have addressed potential areas of concern by establishing an alignment to the west which positioned the pylons on lower ground (than the graduated swathe presented in the 2022 consultation suggested) and more closely aligned it with one of the existing 132 kV overhead lines. This alignment means that Project infrastructure will not impact the Instrument Landing System (ILS) radar nor is at a height relative to the airfield in conflict with safeguarding guidelines.

Minor pylon adjustments in response to other landowner feedback, such as moving RG174 and RG175 out of the centre of views of nearby properties would not be expected to alter the nature of effects and therefore the 2024 preferred draft alignment remains unchanged from the 2023 preferred draft alignment at this location.

Figure 5.13 Alignment at Stowupland (two images)





5.4.88 In addition, the removal of an existing 132 kV overhead line (discussed in more detail below) avoids adding an additional set of overhead lines south of Offton further limiting the change in overhead line infrastructure for Wattisham's activities (albeit the 400 kV pylons would be taller than the existing 132 kV pylons). The further potential for 132 kV overhead line removal to extend through to Stowmarket Substation is still being investigated as potential mitigation for effects on residential amenity near RG175 and is also subject to agreement with UKPN.

Offton to Bramford – Section B

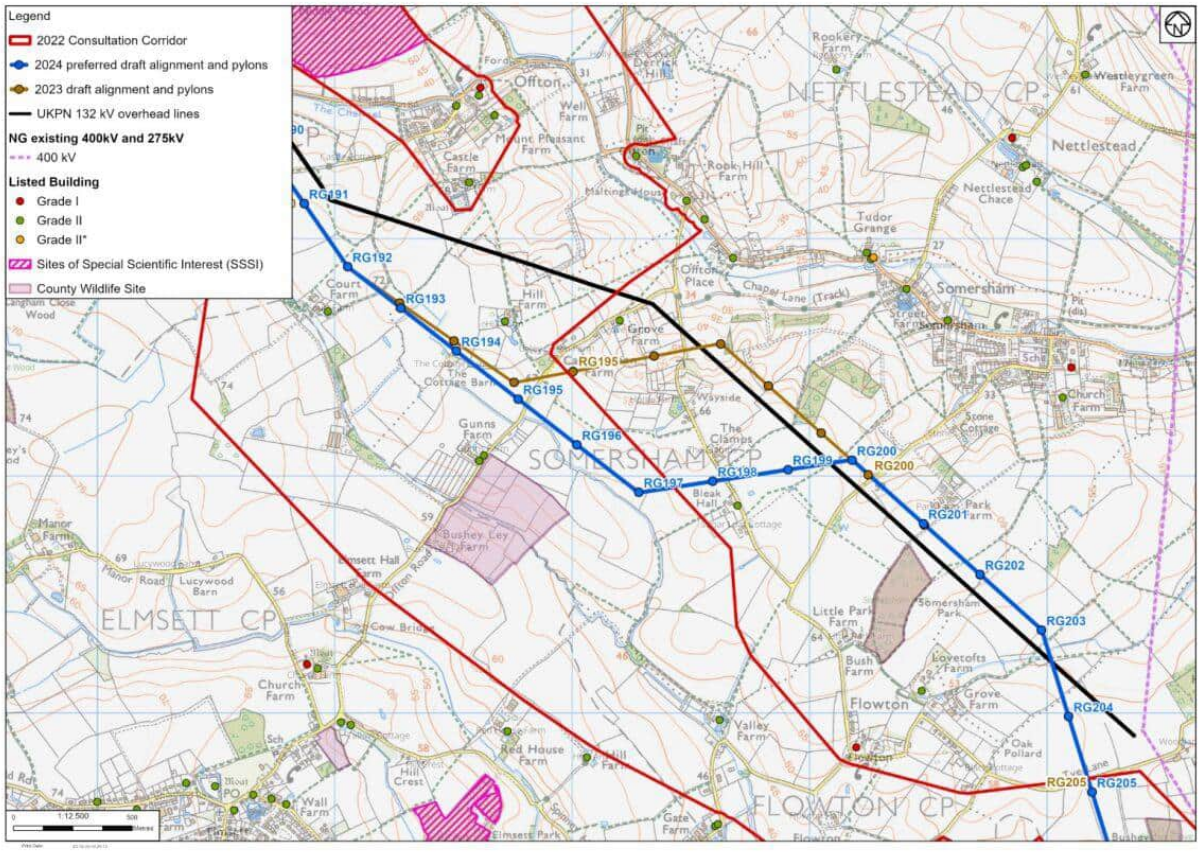
5.4.89 A combination of feedback together with further consideration of the most economic and efficient solution has led to evolution and change to the Project design in this area.

5.4.90 It is now proposed, as an alternative to multiple crossings of the existing 132 kV overhead line (with each crossing requiring two cable sealing end platform pylons to terminate the overhead line at either side of the crossing), to replace the existing 132 kV overhead line with an underground cable connection from a rebuilt cable sealing end platform pylon (identified as PI35) to the north of Offton Wood through to the north of RG186 (identified as RG185 in 2023) this line currently terminates at PI15, and to connect to the existing underground cable into Bramford Substation.

5.4.91 Feedback proposed a change to the 2023 preferred draft alignment which oversail an equestrian school business (oversailed at RG196 on the 2023 preferred draft alignment) and also has residential amenity effects on views from around four properties (Grove Farm and others on Elmsett Road and Wayside to the south). Responding to this feedback, as shown on Figure 5.14, an alternative was considered that comprised continuing the alignment to the south-east of RG195 (previously RG194 in 2023) before turning east to rejoin the route of the 2023 preferred draft alignment at RG200 which itself would be repositioned to the northwest of its 2023 location. This alternative would stay on slightly higher ground than the 2023 preferred draft alignment, which partially drops onto lower ground, however this slightly reduced consistency with the Holford Rule achieves the avoidance of the oversail of the equestrian school business. Additionally, the alternative reduces overall effects on residential amenity albeit some transfer of residential amenity effects occurs to two properties (The Clamps and Bleak Hall) even with pylons positioned outside main views.

5.4.92 Feedback restating a preference for alternative alignments within or to the west of the 2022 Consultation Corridor between Offton and Bramford Substation was also reviewed. In the absence of additional factors or new material considerations it is considered that these alternatives are less preferred. Alignments to the south of Flowton or closer to Elmsett transfer effects to other receptors and increase effects on Grade I listed churches (Church of St Mary and Church of St Peter respectively). It is also notable these alternatives alignments do not directly require the replacement of the existing 132 kV connection with underground cable meaning that any such change (to install underground cable in the place of the 132 kV overhead line) would be determined by the outcome of a cumulative assessment of effects of the various overhead lines which may not in themselves be of sufficient magnitude to lead to a change.

Figure 5.14 Alignment at Offton



Bramford to the AONB including CSE compound location – Section C

5.4.93 Section B ends just to the south of Bramford Substation with the remainder through to the EACN substation within Section C.

5.4.94 National Grid can confirm that sections of the existing 132 kV overhead lines approaching Bramford Substation from the south will be replaced with underground cable to facilitate positioning of the 400 kV alignment. The 132 kV overhead line to the south-east of Bramford (referred to as the PLD line) is proposed to be replaced by underground cable from Bramford Substation to a new cable sealing end platform pylon to the east of PLD48 and a second 132 kV overhead line to the south-east (the PHB line) will be replaced by underground cable from Bramford Substation to the south of PHB22 (see Figure 5.15).

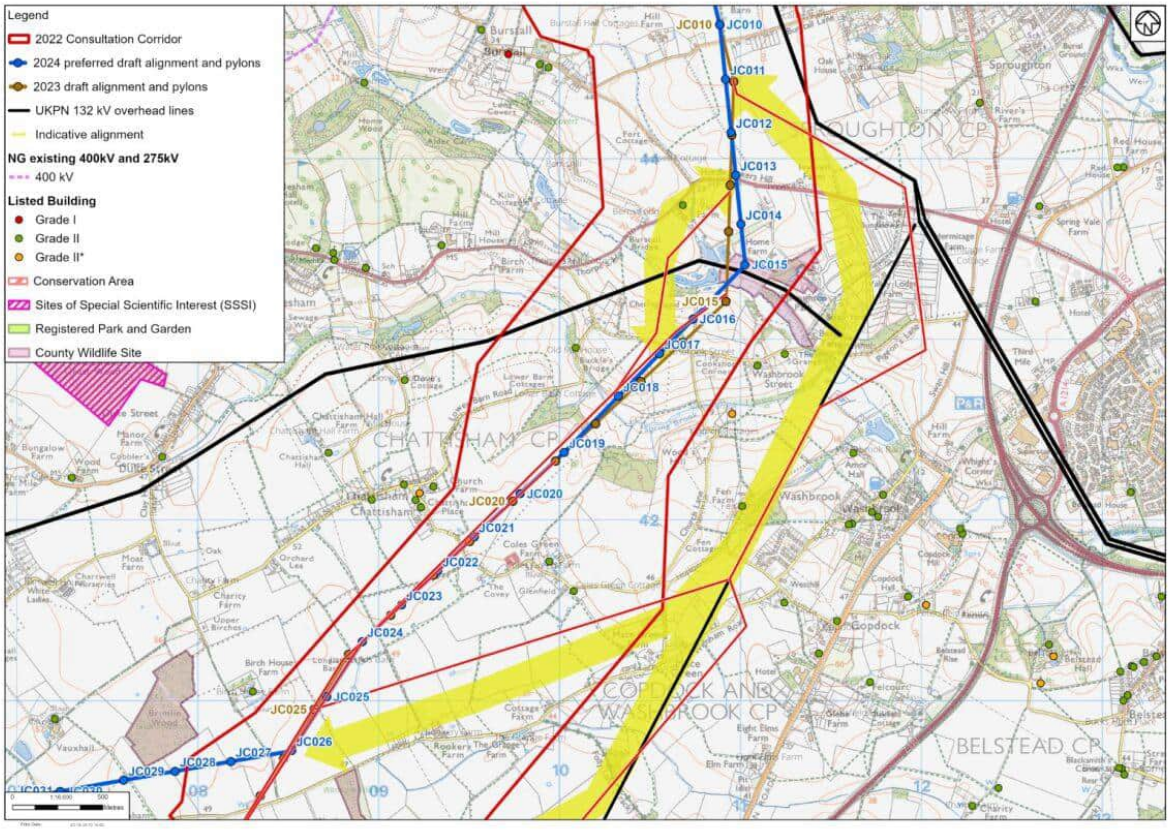
5.4.95 As shown in Figure 5.15, feedback proposed the adoption of the alignment of the 132 kV overhead line from Bramford Substation through to the EACN substation. This has been considered as it may have offered an opportunity to reduce the magnitude of change. The existing 132 kV overhead line however passes between and very close to residential properties (in the order of 30 m from centreline) where the greater scale of the 400 kV infrastructure means that insufficient space is available to achieve acceptable separation from residential properties. This occurs at a number of locations, for example at Mace Green, where there are residential properties to each side at approximately 30 m from the overhead line centreline to each side and at White Horse Road in East Bergholt.

5.4.96 Similarly, there would be increased scale of effects where the existing 132 kV overhead line passes through woodland as additional woodland removal would be required if

replaced by 400 kV infrastructure. Whilst deviations could reduce such effects, they would require multiple angle changes, which would reduce consistency with Holford Rules and have a subsequent increase in environmental effects.

5.4.97 Overall, alternatives following the existing 132 kV overhead line were not preferred and the 2023 alignment has been taken forward as the 2024 preferred draft alignment.

Figure 5.15 Alignment at Chattisham



5.4.98 No conclusion has yet been reached as to whether there is a need to remove the existing 132 kV overhead line through the AONB to mitigate for effects on the AONB arising from the construction of the Project. Removal would either require replacement with an underground 132 kV underground cable connection (likely to be along a similar alignment to the 132 kV overhead line) or the introduction of a Grid Supply Point substation at Lawford close to the EACN substation, to allow the 400 kV connection infrastructure to fulfil the current function of the 132 kV connection. Feedback and assessment findings will inform decision making on this aspect, with the additional cost needing to be justified as being required to mitigate the effects of the Project and being an economic and efficient solution.

5.4.99 Immediately south of Bramford (see Figure 5.16), minor adjustments to the 2023 preferred draft alignment and pylon positions are proposed between JC010 to JC020 (pylon numbers are unchanged) to respond to feedback and likely restrictions to existing land use activities.

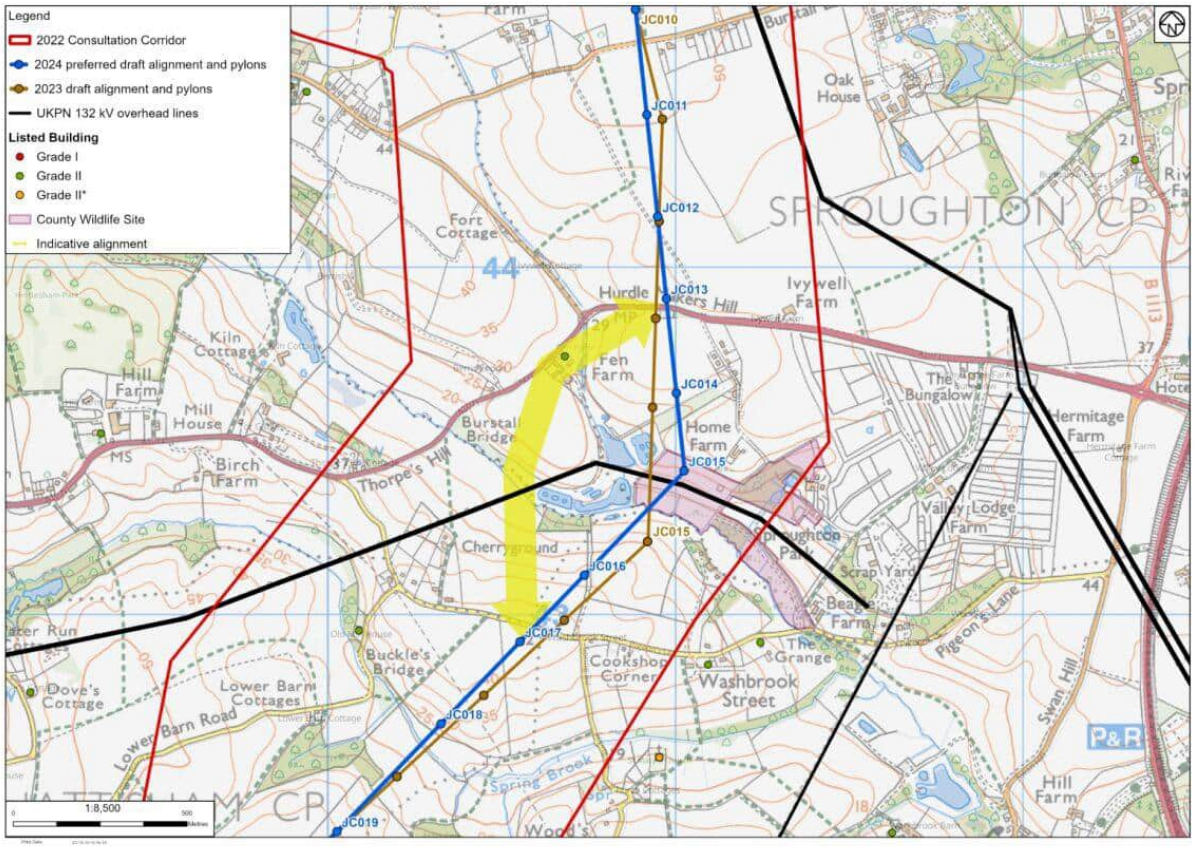
5.4.100 Changes have been made here to avoid oversail of the Hintlesham Fisheries lakes. The 2023 preferred draft alignment could have resulted in cessation of fishing on half of the lakes (due to the need to maintain safe clearances under the alignment) and could have led to business closure. To achieve the change an alternative arrangement has been

developed which moved the alignment slightly further from a new residential property on the south of Burstall Lane but slightly closer to around four residential properties on Valley Farm Drive (separation at around 110 m compared with around 160 m on the 2023 preferred draft alignment), potentially to the side of rear views. Although the angle pylon to the south would have to be positioned in the Sproughton Park CWS it would be on an area of lower ecological interest.

5.4.101 On balance it is proposed to take forward this alternative on the basis that whilst residential amenity effects and ecological effects are potentially increased there are opportunities for additional mitigation and the revised alignment would allow the fishery business to continue to operate.

5.4.102 An alternative passing to the west of the Hintlesham Fishing lakes (between the lakes and Fen Farm) was also considered. Whilst this would move the alignment further from the residential properties on Valley Road it would transfer effects to other residential properties and require the use of multiple angle pylons, increasing local visual effects. This was less preferred than the alternative described above.

Figure 5.16 Alignment at Hintlesham Fisheries



5.4.103 The alternative taken forward at Hintlesham Fisheries has consequential benefits, moving the alignment slightly to the south, responds to feedback to move the Project further from residential properties. The change repositions the angle pylon from the south to the north of the watercourse and allows the pylons to be repositioned to the north, to move further from residential properties around the Washbrook Street and Spring Road junction (increasing the distance to the nearest pylon from around 90 m to around 180 m).

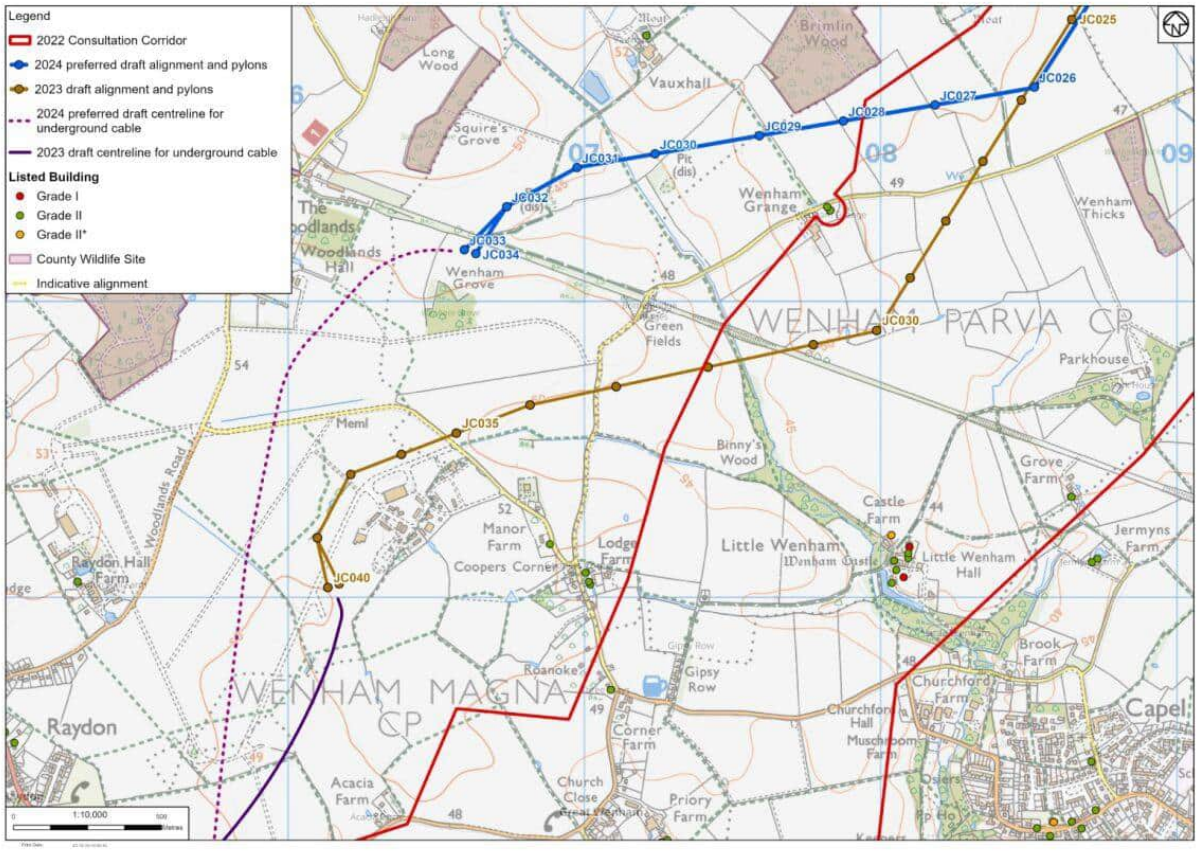
5.4.104 Consultation feedback also highlighted, a need to change the 2023 preferred draft alignment to allow continued flight activities from Raydon Airfield and provided additional

information on potential effects on heritage assets at Little Wenham (various listed buildings including Grade I) and an undesignated war memorial. Further assessments undertaken by National Grid had also noted potential effects in longer views from within the AONB. Alternative siting for the CSE compound was considered with the potential for effects arising from the overhead line connection to a CSE compound from Bramford, and onwards underground cable connection to the EACN substation.

5.4.105 Engagement with Raydon Airfield identified that there was insufficient clearance to the 2023 preferred draft alignment. To achieve the necessary clearance required the overhead line to either be moved further south from JC30 or further north from around JC26. A southwards move was considered but not taken forward as it would increase effects on the heritage assets at Little Wenham. On this basis this was not considered acceptable in terms of National Grid's statutory duties and policy (set out in NPS EN-1, EN-5 etc) and heritage specific policies (e.g. Planning (Listed Buildings and Conservation Areas) Act 1990).

5.4.106 Alternative locations for the CSE compound were considered guided by the Horlock Rules. These included a site between Wenham Grove and the disused railway as well as a site to the north of the disused railway (around JC032 on the 2024 preferred draft alignment). Siting north of Wenham Grange using Brimlin Wood as screening / backclothing (around JC029 to JC028 on the 2024 preferred draft alignment) was also considered (see Figure 5.17).

Figure 5.17 CSE siting and alignment north of the AONB



5.4.107 Compared with the 2023 proposed site at Notley Enterprise Park, the alternative, to the north of Wenham Grove but south of the disused railway, would provide a location which would benefit from more screening from long distance views (some from within the AONB). It would also reposition the 2023 preferred draft alignment further north reducing

the potential effects on the heritage assets at Little Wenham (increasing separation from around 750 m to around 1500 m). In addition, it would allow continued flight activities at Raydon airfield, avoid effects on a model aircraft club (which uses land occupied by the 2023 proposed CSE compound location) and reduce heritage effects on the war memorial. This change would however also transfer some effects from residential properties at Bottle Bridge Corner and Wenham Grange to those at Vauxhall.

5.4.108 The alternative site adjacent to this but to the north of the disused railway would achieve similar beneficial changes in respect of views from the AONB, the flight activities at Raydon Airfield and heritage effects at Little Wenham but is considered less well screened from views from the north (albeit mitigation planting would address this over time) and would increase effects at Vauxhall. It also requires a longer section of underground cable and therefore provides a less economic basis for the connection.

5.4.109 Other alternative locations further east, near Brimlin Wood, would provide similar beneficial change and also would also reduce effects further by the replacement of around 1 km of overhead line by underground cable through predominantly arable farmland. However, such a change to underground cable is not considered to be consistent with the criteria set out in NPS EN-5 paragraph 2.9.23. This change would be less economic and therefore is not considered to be justified.

5.4.110 Overall, it was concluded that a change of CSE compound location to the alternative site to the north of Wenham Grove but south of the disused railway is now preferred. This includes consequent adjustments to east and west overhead line and underground cable connections. The change reduces effects on the distant views from AONB, supports continued flight activity at Raydon Airfield as well as reducing effects on heritage assets. This reduction is considered to be required to be consistent with National Grids duties and relevant planning and heritage policies, with the Project representing the most economical way of achieving those aims locally.

5.4.111 Consideration has also been given to feedback specifically proposing a number of alternative variations to move the overhead line further from the cluster of listed buildings at Little Wenham by extending the underground cable further from the boundary of the AONB either further to the north or further to the east (potentially through to Bramford Substation).

5.4.112 Residential properties and other constraints to routeing mean any potential alternative to the north has to be routed to the north of the existing and proposed 400 kV Bramford to Twinstead Reinforcement overhead line, necessitating two crossings of existing 400 kV infrastructure.

5.4.113 Potential alternatives to the east were considered, with underground cable extending towards lower ground near Washbrook or through to Bramford Substation. In neither case is the landscape designated such that it would lead to a presumption for underground cable (as set out in EN-5 paragraph 2.9.10) nor are potential landscape and visual effects considered to be at a level to justify the effects and additional costs of underground cable in line with NPS EN-5 paragraph 2.9.23.

5.4.114 Similarly, whilst based on preliminary assessments, heritage effects are not considered to require the need for adoption of underground cable given that an alternative overhead line alignment is available that can achieve separation from the listed buildings and that substantively reduces potential effects. There is therefore no basis in policy to consider the residual effects arising from an overhead line to be such as to justify the additional costs and effects of more extensive underground cabling to reduce potential heritage effects on the features at Little Wenham.

North of the AONB to the EACN substation (underground cable) – Section C

5.4.115 With the exception of the adjustment required to connect with the proposed revised CSE compound location, routeing of the underground cable corridor from the north of the AONB to the EACN substation has not materially changed from the 2023 preferred draft alignment with the majority of the route proposed to be installed using open cut techniques.

5.4.116 A number of additional locations have however been identified where it is proposed to utilise a trenchless crossing technique such as Horizontal Directional Drilling (subject to confirming appropriate ground conditions). The proposed locations for this and reasons for preferring this technology in these locations are set out as follows:

- archaeological area principally to the south of Higham Road but also extending a short distance to the north. Additional information has identified an area of particular archaeological interest (including a number of Bronze age barrows) to the south of Higham Road. It is considered that effects will be considerably reduced by the adoption of trenchless technology to pass under these features;
- River Stour crossing - it may be possible to develop an approach to cross the River Stour by the use of open cut techniques (use of coffer dams or over-pumping), however, to reduce effects given the ecological sensitivity (including SSSI, Ramsar and European designations downstream) it is proposed to utilise a trenchless crossing technique. Available ground investigation information suggests that conditions are such (peat/peaty soil over sand and gravel) that the use of a trenchless technique (such as Horizontal Directional Drilling) is potentially restricted. Achievable distances are influenced by localised conditions but are likely to be a maximum of around 250 m (and potentially much less than this) with the remainder of the underground cable needing to be installed by open cut techniques. We will continue to gather feedback and information to inform final decision making in this area;
- woodland area within the Dedham Vale AONB adjacent to the Grade I Listed Church of St Mary - apart from their ecological value, areas of woodland are important features of the AONB and in this case would also provide screening for the Grade I Listed church. The use of a trenchless crossing technique is therefore included to allow retention of the woodland;
- A12 crossing - given the importance of the A12 for traffic movements, and the additional technical complexities of embanked sections, open cut trench installation methods are not considered appropriate for this road crossing and therefore trenchless techniques are proposed; and
- railway crossing to the east of Ardleigh - in order to minimise the potential for effects on rail infrastructure a trenchless crossing technique will be adopted to cross under the rail line to the east of Ardleigh.

5.4.117 A number of respondents proposed specific restrictions to working areas or proposed moving the underground cable corridor as it enters the AONB from the north. These were:

- Bobbitts Hall – it may not be possible to restrict construction to the west side of an area of hedgerow (although this will be subject to the outcome of ground investigations). It may however be possible to work to either side to avoid direct effects to the hedgerow; and

- Pintins - the underground cable alignment cannot be moved to the east beyond the hedgerow to the east of the first field due to proposed mineral workings, the presence of a gas pipeline and a number of veteran trees.

EACN substation - Section C

5.4.118 Feedback to the consultation included restatement of the preference for the EACN substation to be sited at other locations. The previous findings have been reviewed and it has been concluded, in the absence of additional factors or new material considerations, that the proposed EACN substation site close to Lawford Substation remains preferred for the reasons set out in the 2023 Design Development Report (paragraphs 5.5.84 to 5.5.98) which are summarised as follows. Sites closer to the coast would lead to greater environmental effects because of the two overhead line connections that would be required through the Tendring Peninsula noting that there is not considered to be a basis to support one or other of these connections being installed as underground cable in line with NPS EN-5. Sites proposed to the north and/or west of Ardleigh are less preferred either because they do not have the scale to accommodate the EACN substation and customer substations, or because of the effects arising from the need to use multiple corridors, including through the AONB, to install the underground cable connections for the customers and potential UKPN back feed. National Grid is however continuing to review the requirements in the context of emerging design development.

5.4.119 No final decision has yet been taken on the technology choice to be adopted (Air Insulated Substation (AIS) or Gas Insulated Substation (GIS)). In the absence of a requirement for GIS (normally only adopted when in close proximity to marine environments or where space is very constrained) we are continuing to progress on the basis that AIS technology is most likely. Although AIS requires more extensive land area it has reduced visual effect by virtue of generally lower height equipment.

EACN substation to Great Horkesley (Eastern CSE compound) – Section C and D

5.4.120 The route commences in Section C, changing to Section D at the A12 in the TB overhead line section.

5.4.121 Feedback from various respondents requested the proposed overhead line be replaced by the use of underground cable between the EACN substation and the Great Horkesley underground cable section. This area is not subject to designations that change the presumed general acceptability of overhead lines (as set out in EN-5) although the overhead alignment is relatively close to the Dedham Vale Natural Landscape (AONB). However, whilst potentially visible from locations within the AONB it is not considered that this would lead to effects that would justify, in policy terms, the very substantial additional costs and environmental effects arising from the installation of underground cable.

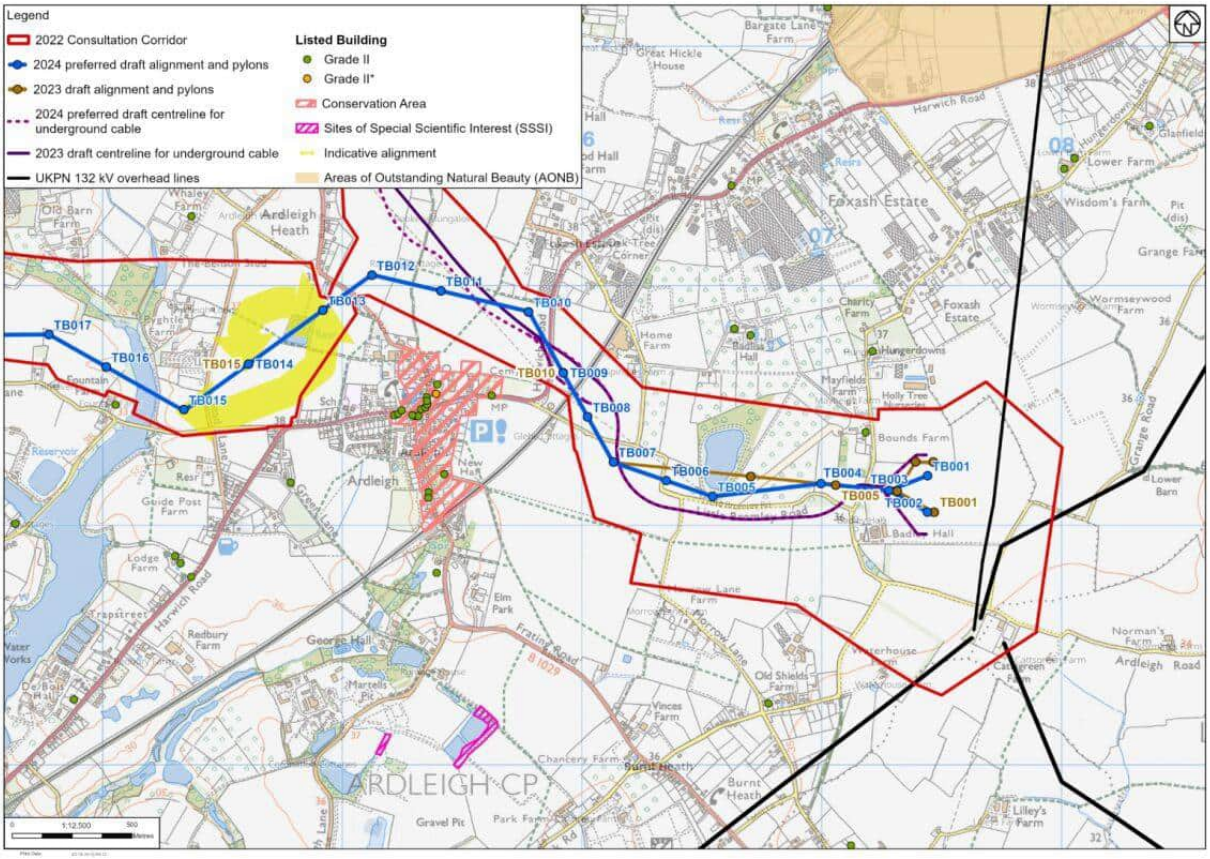
5.4.122 Additionally, there are various locations (for example the crossing of Ardleigh reservoir and at the Wick Lane and Old Ipswich Road junction) where the adoption of underground cable would present substantial technical challenge that may not be possible to address without further increased effects. It is therefore considered that the use of 400 kV overhead line is still the most appropriate connection technology in this area.

5.4.123 Heading west from the EACN substation, minor adjustments to the 2023 preferred draft alignment are proposed with the removal of pylon TB03 (as identified in 2023) as a result of modifications to the line entry arrangements at the EACN substation (see Figure 5.18).

- In response to feedback to avoid effects on the trees along the southern boundary of Bounds Farm (to the north of span TB003 to TB004 (identified in 2023 as TB004 to TB005)) the construction swathe will be restricted here.

5.4.124 Through landowner engagement the potential for effects on a fishing lake due to oversail by the overhead line between 2023 preferred draft alignment pylons TB006 and TB007 has been identified. Where such oversail occurs, fishing activity would need to be restricted for safety reasons and here the 2023 preferred draft alignment would potentially have affected around half of the lake. The alternative is to realign the overhead line between TB004 and TB007 (identified as TB005 to TB008 in the 2023 preferred draft alignment) introducing additional angle pylons to reduce the oversail, with pylons also positioned to reduce effects on a fruit farm. This change introduces two additional angle pylons with consequent additional visual effects (and is less consistent with the Holford Rules). The closest residential properties either benefit from some visual screening (e.g. Bounds Farm) or are at around 500 m or greater distance. On balance it is considered preferable to take forward the realignment to reduce the impact on the fishing lake on the basis of the separation and / or vegetation filtering between the angle pylons and the closest residential properties.

Figure 5.18 Alignment at Ardleigh



5.4.125 Feedback and technical review led to consideration of alternatives to cross another water body to the west of Ardleigh to the south-west of TB013 (2024 previously identified as TB014 in the 2023 preferred draft alignment) (see Figure 5.18), In view of the orientation and size of this waterbody the safety considerations would effectively preclude what were reported to be relatively informal and infrequent angling activities, if the 2023 preferred draft alignment was retained. Alternatives to avoid oversail of the water body, to allow continuation or intensification of angling were considered. These would necessitate multiple changes of direction, give routeing constraints and the presence of residential

properties, whether passing to the east (residential properties within 200 m) or west (residential properties within around 100 m) of the water body.

5.4.126 These multiple angle changes would reduce consistency with the Holford Rules and increase effects to multiple residential properties close to the alignment in this area. Due to the limited and informal level of angling activity and the additional environmental effects from the alternatives, retain the straighter 2023 preferred draft alignment and oversail the waterbody was preferred although recognising that this would terminate the informal angling arrangements. Compared with angling activities discussed in respect of the lake to the east of Ardleigh, the fishing activity in the water body to the west is more limited and informal and the alternative would have much reduced separation to residential properties hence why a different conclusion is drawn.

5.4.127 The proposed draft order limits have been widened around the junction of Wick Lane and Old Ipswich Road adjacent to the A12 to facilitate a response to several development proposals. The 2024 preferred draft alignment avoids the proposed developments and engagement is ongoing with various parties regarding the detail of the individual planning applications (distribution warehouse, light industrial units, quarry, and a water supply reservoir). The final outcome of those discussions may necessitate some limited adjustment to routeing post statutory consultation to minimise interaction with the various proposals.

Underground cable at Great Horkesley – Section D

5.4.128 In response to feedback, we have removed the previously proposed split corridor to the south of Knowles' Farm and restricted the construction corridor to the south of a belt of trees. This does require the draft order limits to be widened to east and west to accommodate the construction works.

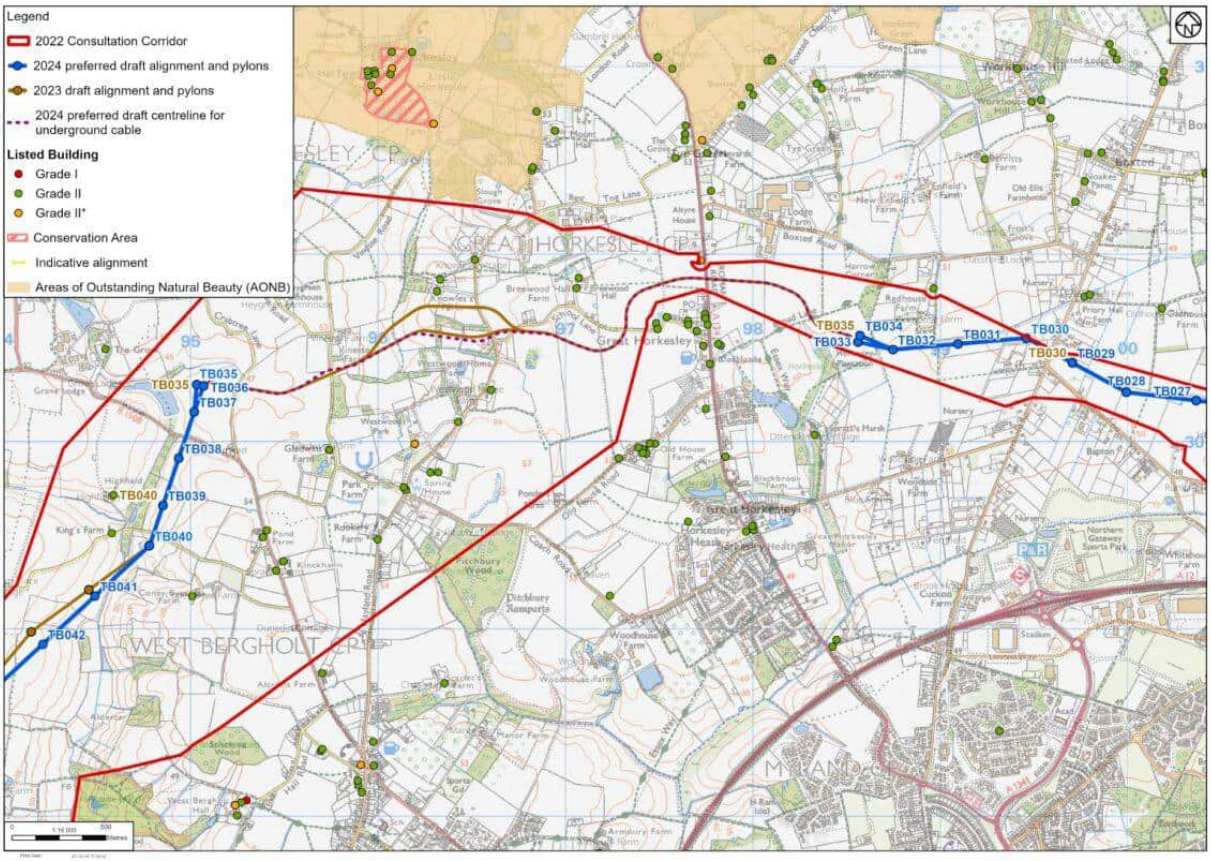
5.4.129 Feedback suggested a number of alternative locations for the CSE compounds to the eastern and western ends of the underground cable section at Great Horkesley in order to reduce potential effects. The alternatives proposed were:

- East – To the eastern edge of the field proposed in the 2023 non-statutory consultation;
- East – Into the next field to the east (around TB032);
- East – To the east of TB029 (previously identified as TB030); and
- West – To around TB040.

5.4.130 Locations to the east, moving the CSE compound to the edge of the field or to the next field to the east, were seeking additional screening to views from residential properties to the north (at over 400 m separation) or to move the CSE compound out of a highly productive agricultural field.

5.4.131 Whilst noting the potential to reduce visual effects to the particular residential receptors, these alternative CSE compound locations were previously considered (2023 Design Development Report) and remain less preferred for the following reasons. The location of an existing gas pipeline restricts the extent to which a localised eastwards move can be made whilst ensuring safe working stand-off is maintained. A move eastwards would also require an extended length of underground cable (with associated effects and costs) in circumstances where it is considered that the level of effects on the AONB and on residential amenity do not meet the thresholds identified in NPS EN-5. On this basis these alternative locations are less preferred.

Figure 5.19 Alignment at Great Horkesley



5.4.132 Feedback also suggested, a further alternative to the east, to around TB028 (on the 2024 preferred draft alignment) to reduce effects arising from close proximity of an overhead line to a number of residential properties around the crossing of Straight Road. At this location there are a number of properties to each side of the overhead line at under 100 m to the centreline (closest at around 70 m) though distance and level of screening of the nearest pylon varies. This alternative would reduce some effects to residential amenity for several residential properties but would require approximately 1.5 km of additional underground cable with the costs and environmental effects arising from the alternative technology.

5.4.133 The location for the east of Great Horkesley CSE compound proposed within the 2023 preferred draft alignment is outside the AONB designation. National Grid also considers that any effects on the AONB or on other receptors in terms established in NPS EN-5 Section 2.9 do not occur at a level that would be considered to meet a threshold justifying the effects and additional cost of a further 1.5 km of underground cable. On this basis the alternative CSE compound location to the east, in the vicinity of TB028 (on the 2024 preferred draft alignment) is less preferred and no change to the eastern CSE compound is proposed.

5.4.134 An alternative location for the western CSE compound at Great Horkesley was raised in feedback with a preference for a location closer to TB040 (2023 preferred draft alignment). This site was considered as part of the development of the 2023 preferred draft alignment but it was less preferred. Respondents providing feedback requested moving the location of the western CSE compound further to the south to reduce residential amenity effects to a number of residential properties and to reduce effects on the AONB. Whilst acknowledging the reduction in effects from such a change, it is noted that the change would transfer such effects to other residential properties. It is also

considered that any effects on the AONB in terms established in NPS EN-5 section 2.9 do not occur at a level that would be considered to meet a threshold justifying the effects and additional cost of additional 800 m of underground cable. In reviewing the previous decision making, no new material considerations nor change to factors considered has been identified. As a result, it is considered that the additional costs and effects to extend the underground cable to a different CSE compound location are not consistent with policy. In light of this and the transfer of effects to other receptors no change is currently proposed.

5.4.135 At the current time no trenchless crossings are proposed on this section of underground cable. However, in response to feedback, the construction swathe has been restricted in the area south of Knowles Barn and to the west of London Road. It is proposed to restrict construction to only the southern arm, where the corridor was split into two arms in the 2023 preferred draft alignment. This positions the construction swathe between belts of trees running east to west. This restricted width necessitates the temporary use of greater areas of farmland to east and west of the area but avoids the potential for interaction with a private garden associated with Knowles Barn. It also reduces the potential effects on the tree belts to north and south of this section.

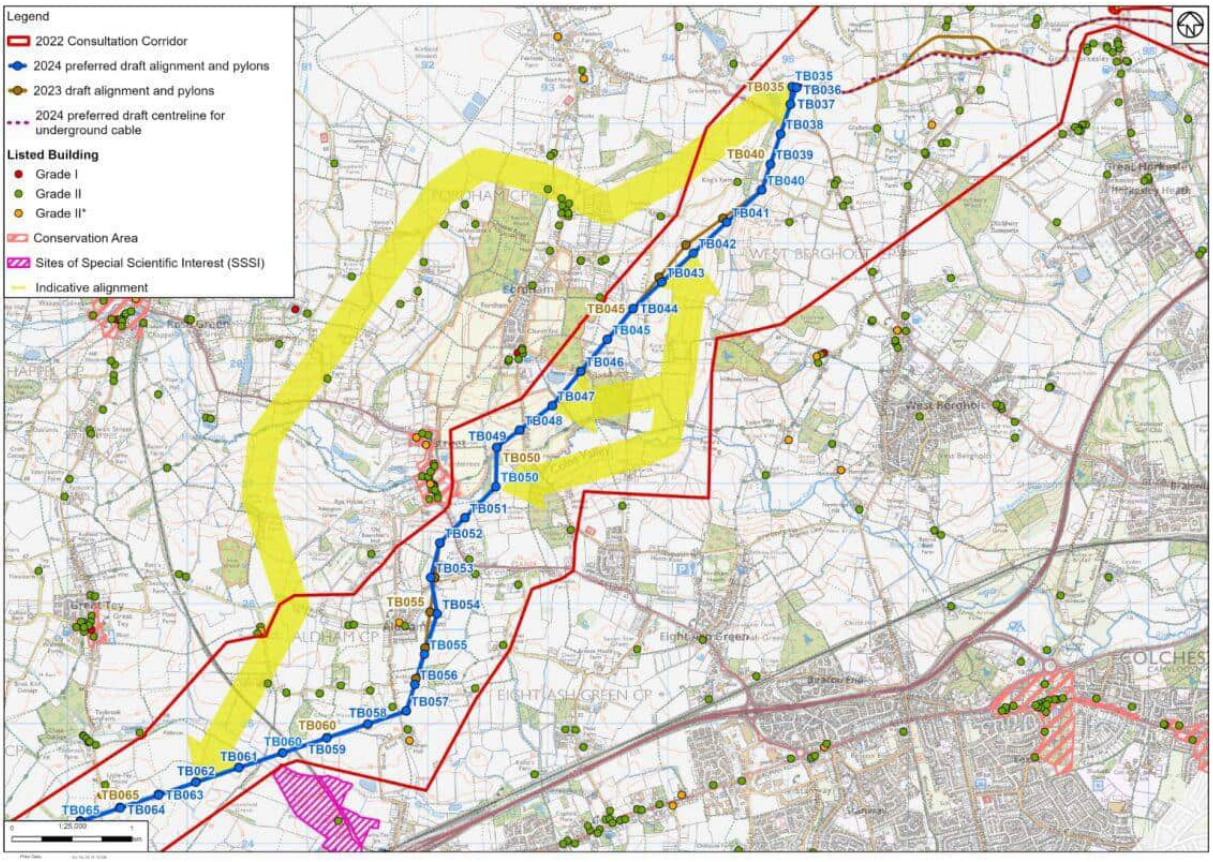
Great Horkesley to Little Tey – Section D

5.4.136 Consideration has been given to an alternative alignment suggested in feedback to pass to the west of the villages of Ford Street, Fordham and Aldham to reduce potential effects rather than remaining on the 2023 preferred draft alignment that passes to the east (see Figure 5.20), A provisional alignment, based on an indicative sketch provided in feedback, was developed applying the same route development approach underpinning the 2023 preferred draft alignment. The alternative would commence at the western Great Horkesley CSE compound heading south-west then west passing just to the south of Houd's Farm. It would then turn southwards to pass between Hemp's Green and Sutton's Farm, then continuing to the west of Penlan Hall and Oak Farm, crossing the A1124 between properties at Braeburn and White Acres. It would then route to the east of Wick Farm and Hoe Wood, and west of Hoe Farm before crossing the railway and connecting to the 2024 preferred draft alignment around TB063.

5.4.137 In comparison with the 2023 preferred draft alignment it is considered that there would be a transfer of effects from receptors in Aldham, Fordham and Ford Street to other, more dispersed receptors in the west. The western alternative would be around 0.6 km longer, with an estimated additional 3 pylons and 3 additional angle pylons, therefore overall, it would be a less economic alternative. Both options would cross the Colne Valley and its associated flood zone (the western option where the flood zone is about twice the width) though it is likely that micrositing of pylons can be utilised to avoid these zones. More residential properties are located around the western crossing which may limit siting given the approaching alignment from the north.

5.4.138 Whilst proximity of the western alternative to Wormingford Airfield is noted, the runway orientation and likely distance from the alignment are considered to reduce the potential for the Project to have effects on flight activity. These would however be considered to be greater than on the 2023 preferred draft alignment to the east given the closer proximity.

Figure 5.20 Alignment at Fordham and Aldham



5.4.139 Visual effects are anticipated on both alignments. there are more residential properties within 200 m of the 2023 preferred draft alignment (estimated at 49 compared with an estimated 28 for the western alternative). The majority of the 49 are concentrated at Aldham, compared with the more dispersed pattern for the western alternative. When considering proximity to residential properties, where there is no intervening property between them and the alignment, the difference narrows to an estimated 36 on the 2023 preferred draft alignment compared with 28 on the western alternative. Individual property orientations, landform and existing vegetation will influence the level of effects.

5.4.140 Both alignment options would also have landscape effects. The landscape of the River Colne and its tributaries has a number of valued attributes which together increase the sensitivity of the landscape to an overhead line. These attributes include the undulating and sometimes steep topography of the valley sides, frequent tree cover including riparian vegetation along the river and its tributaries, open access land and opportunities for recreation. The 2023 preferred draft alignment would traverse a localised ridge to the east of Fordham which would conflict with landform and to the south would also cross the Colne Valley where landform is relatively steep and there is a concentration of PRoW and open access land. In addition, mature tree cover associated with the river corridor and areas of recently planted trees on Woodland Trust's Fordham Hall Estate would be affected. The western alternative would likely have an overall lower landscape effect. There would be less conflict with landform and tree cover and this alternative would cross the Colne Valley in a location where there is slightly reduced recreational value in terms of less dense of PRoW and avoiding open access land.

5.4.141 Ecological effects are anticipated on both alignments, and neither are considered to be inconsistent with planning policy or other ecological legislation (e.g. The Wildlife and Countryside Act), though the western alternative would have lower effects particularly by

avoidance of albeit small areas of newly planted woodland on the Woodland Trust's Fordham Hall Estate.

5.4.142 Both alignments are likely to result in effects to all grades of listed buildings. There are a similar number of listed buildings overall on the 2023 preferred draft alignment as on the western alternative. However, the western alternative passes the Grade I Listed Crepping Hall at approximately 400 m distance (other residential properties restrict increased separation from the Hall) and passes this distance or closer to several non-designated moats (Crepping Hall, Hoe Farm, Houd's Farm amongst others). All but one of these moated sites are associated with listed buildings, which increases their value over non-designated moated sites not associated with listed buildings. In comparison with the 2023 draft alignment the concentration of moated sites either side of the western alternative is much greater leading to a much greater impact through change to setting affecting the value of designated heritage assets than the 2023 alignment.

5.4.143 Overall whilst noting some potential for a reduction in the number of residential properties with potential amenity effects if the western alternative was taken forward, this would be a longer less economic and efficient route with more pylons and angle pylons. It would also potentially increase effects in respect of construction within a flood zone (but subject to micrositing this difference may be avoided) and be likely to increase effects on heritage assets including a Grade I listed building and several moats associated with listed buildings. It is also noted that the 2023 preferred draft alignment is consistent with policy and overall, it is considered that there would be insufficient benefits from potentially reduced residential amenity and landscape effects of the western alternative to offset the technical concerns and additional infrastructure required for delivery it. On that basis the 2023 preferred draft alignment, subject to localised modifications, remains preferred and has been taken forward as the 2024 preferred draft alignment.

5.4.144 In response to feedback, other localised alternatives over shorter parts of the 2023 preferred draft alignment have also been considered (also shown on Figure 5.20). These included more easterly crossings of the Colne Valley, including paralleling Fossetts Lane, and crossing south of Watercress Hall. On review it was identified that all such alternatives were substantively constrained to the south of the River Colne due to restrictions presented by residential properties around Fordham Heath and Eight Ash Green, and Fiddlers Wood Ancient Woodland. There are particular constraints at Fordham Bridge where the combination of utility infrastructure, ancient woodland, flood zone and watercourse are considered to preclude overhead line routeing. On this basis these more easterly alternatives were not preferred and were not taken forward.

5.4.145 Feedback also repeated previous suggestions for the crossing of the Colne Valley to be made by underground cable. No new material considerations or new or amended factors have been identified with the exception of the updated NPS EN-5 (January 2024). This provides the policy framework guiding decision making on the use of underground cable outside designated areas and has informed the completion of the backcheck.

5.4.146 The valley of the River Colne was previously identified in local planning policy as a proposed Countryside Conservation Area, though this local designation no longer exists within planning policy. The relevant part of NPS EN-5 is paragraph 2.9.23 and subsequent guidance on decision making. Whilst noting the potentially higher relative landscape value and sensitivities there are limited other factors relevant to decision making around the valley. As such National Grid does not consider, in the context of planning policy, that the potential effects of an overhead line are such that they justify the additional cost and environmental effects associated with the use of underground cable, even if restricted to around a 1 km section centred on the crossing of the River Colne.

5.4.147 To address other effects, such as potential effects on residential amenity at Aldham, would require an extension of the underground cable section crossing the valley to around a minimum of 2.5 km, and potentially further, subject to siting to the north of the valley. It is National Grid's view that an overhead line is not inconsistent with policy in NPS EN-5 and from this it follows that it is not considered that the combination of effects in this area justify the additional costs and effects associated with adopting underground cable. On this basis the connection is being taken forward as an overhead line in this area.

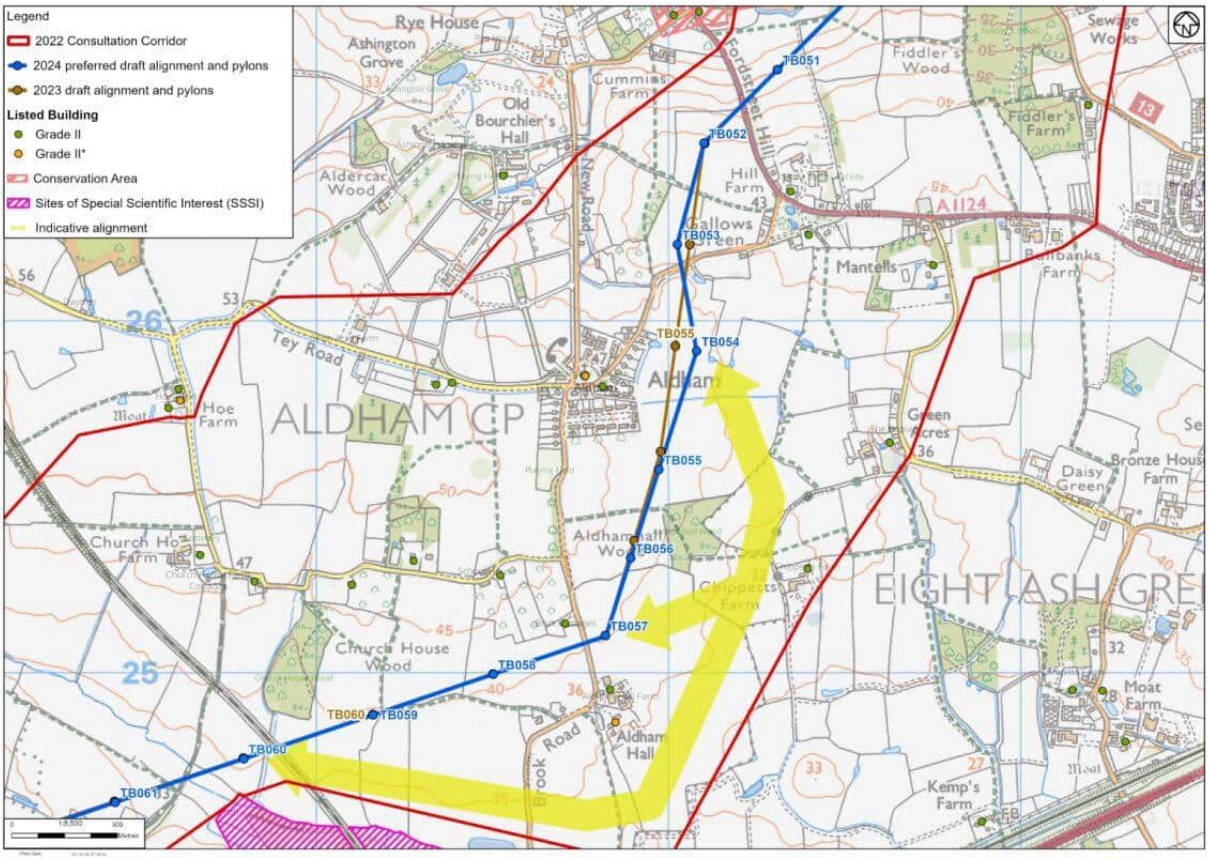
5.4.148 Responding to feedback to avoid a newly constructed private reservoir, a minor adjustment of the 2023 preferred draft alignment is proposed between TB041 to TB045 (2024 identification as TB040 to TB044) by moving the angle pylon position. This slightly increases separation to and reduces residential amenity effects on residential property at Fordham Place Cottage.

5.4.149 As noted above, the preferred arrangement in the vicinity of Fordham and Aldham continues to be an overhead line connection passing to the east of the villages. In response to feedback to reduce residential amenity effects to residential properties at Aldham however an alternative alignment with modified pylon positions between TB053 and TB058 (identified as TB052 to TB057 in 2024) to increase separation was considered. This requires the introduction of an additional angle pylon and the swop of TB56 and TB54 (as numbered in the 2023 preferred draft alignment) to suspension and angle pylons respectively. Adopting the alternative would increase separation between pylons and the nearest property, from around 75 m (to a suspension pylon in the 2023 preferred draft alignment) to around 140 m (from an angle pylon on alternative) at TB055 (as referred on the 2023 preferred draft alignment) and from around 80 m (to an angle pylon in the 2023 preferred draft alignment) to around 120 m (to a suspension pylon on the alternative) at TB056 (2023 preferred draft alignment). On balance the slightly reduced effects from the alternative are preferred and have been taken forward in the 2024 preferred draft alignment.

5.4.150 A number of alternatives to divert the alignment to pass to the east and south of Aldhamhall Wood by extending the alignment on from TB053 to TB054 by around two or three spans were considered (see Figure 5.21). These included reconnecting at TB057 (approximately 300m longer with one additional pylon required and one more angle pylon) and further alternatives passing to the south of Aldham Hall (approximately 600 m longer with two additional pylons required and two more angle pylons). Whilst noting that the alternatives all reduce proximity to a number of residential properties at the south-east corner of Aldham (noting most views are side views), effects are transferred to some degree to others further to the west and particularly to Chippetts Farm which is also a Grade II listed building. This would have open views of a nearby pylon and approaching alignment.

5.4.151 On balance given the longer alignment and increased heritage effects these alternatives were less preferred.

Figure 5.21 Alignment at Aldham



Little Tey to Rivenhall – Section D and Section E

5.4.152 The alignment starts within Section D before crossing into Section E around the crossing of the A120 near Surrex.

5.4.153 Feedback restated the potential interaction between the 2023 preferred draft alignment and land under option for housing development to the north and southwest of Marks Tey.

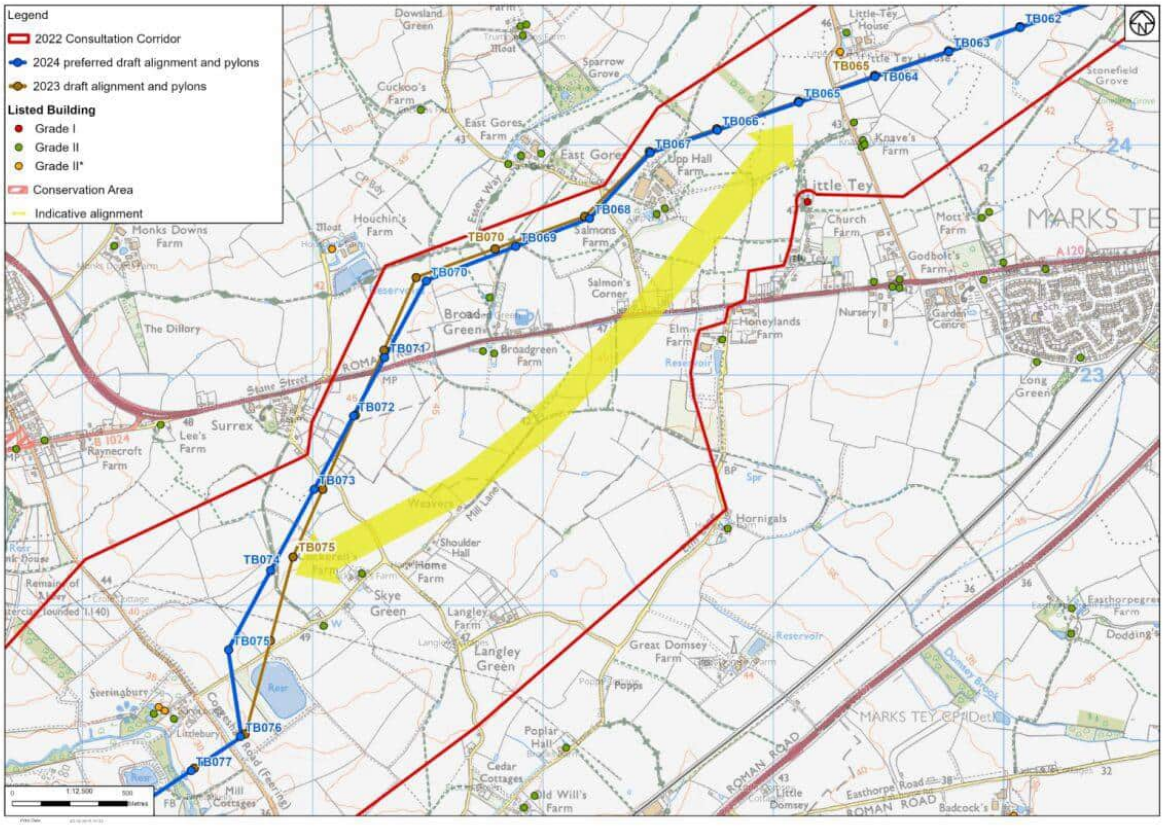
5.4.154 The land to the south-west is only crossed at its western most extent where previous feedback has indicated the alignment may well coincide with green space or have least interaction with potential built development. The northern site would be crossed around two thirds of the way up the site but again the extent of any interaction is unknown. Experience does show that there is the potential to integrate the Project with green space within similar developments.

5.4.155 As is noted in paragraph 5.4.4 only those developments that have reached a particular stage in the planning process have been considered. At this stage neither of these areas have reached a degree of planning status at which they would be considered as influencing factors and no change to the 2023 preferred draft alignment is therefore proposed.

5.4.156 Other feedback proposed an alternative routeing to the south side of Upp Hall Farm (see Figure 5.22), which would be from around TB065 (on the 2024 draft alignment). This alternative would increase effects on the Grade I Listed Church of St James at Little Tey and has potential to increase effects on residential amenity by adopting a crossing point where the separation to properties is reduced compared with the 2023 preferred draft alignment. For these reasons this alternative is less preferred and routeing to the north side of Upp Hall Farm has been retained within the 2024 preferred draft alignment.

5.4.157 The 2023 preferred draft alignment has however been slightly modified from where it passes Upp Hall Farm and onwards to the south to respond to feedback to reduce oversail of a carp fishery (oversailed by the span between TB076 and TB077 in the 2023 preferred draft alignment and now adjacent to TB075 in the 2024 preferred draft alignment). The 2023 preferred draft alignment may have restricted fishing on potentially upto half the lake depending on final alignment. Additionally, feedback also requested that National Grid seek to either position pylons on field boundaries or sufficiently clear of the field boundaries so as not to impede farm equipment. An alternative alignment was developed which changes the alignment to pass to the west of the fishing lake avoiding oversail and thus not restricting fishing. This moves TB075 and TB076 (as identified on the 2023 preferred draft alignment) further from and closer respectively to residential properties though separation of around 250 m is still achieved from the closest. On balance the alternative is preferred and has been taken forward in the 2024 preferred draft alignment.

Figure 5.22 Alignment at Little Tey



5.4.158 After crossing the A120 the Project moves into Section E. Feedback also requested avoidance of oversail of land subject to a change of use from farmland to garden and equestrian land. This would require an additional angle pylon and a larger change of direction and is considered less consistent with Holford Rules and not taken forward.

5.4.159 Routeing southwards from the now TB075 (on the 2024 draft alignment) has been reconsidered in response to feedback to reduce effects on vine and fruit crops. In the absence of new material consideration or additional factors the outcome, as set out in the 2023 Design Development Report (from paragraph 6.4.112) remains unchanged. Alternatives to north or south of the 2023 preferred draft alignment either increase effects on heritage assets or increase effects on a greater number of existing and planned residential properties. These are therefore less preferred.

5.4.160 The position of some pylons within the cropped area has however been modified to position them closer to the edges of fields (albeit not providing a solution entirely avoiding the cropping). Site access elements (bell mouths, access roads etc) have been positioned to reduce the extent of any crop impacts.

5.4.161 Feedback also asked for reconsideration of routeing westwards from TB083 (as identified in the 2023 preferred draft alignment) and to adopt an alternative on a straighter alignment to reduce heritage and residential amenity effects. Whilst noting the potential for a change in status of mineral extraction opportunities (National Grid was advised a review may be published in early 2024 but notes this was not available at the time of writing) it is proposed to straighten the alignment at this stage but with extended draft order limits to facilitate realignment should the planning status of the mineral extraction opportunity change.

5.4.162 West of this area, feedback requested the 2023 preferred draft alignment be amended to avoid or reduce effects on Ruffian's Wood used by a dog related commercial enterprise (also a Woodland Trust site) between TB088 and TB089 (identified as TB089 and TB090 in 2023). Feedback also requested that the alignment more closely follow the edge of a field to the southwest of Ruffian's wood.

5.4.163 Alternative alignments to avoid the wood entirely, by routeing either to the north side or south side, were considered but are both longer and less direct. They would result in the transfer of effects to other similar receptors and for a southern alternative route be likely to increase effects on the Grade II Listed Rook Hall. On this basis these alternatives were considered less preferred and were not taken forward.

5.4.164 Consideration has also been given as to whether local adjustments could go some way to alleviating concerns raised in the feedback even though avoidance is not considered achievable. It is now proposed to move around 60m west from the 2023 preferred draft alignment, thereby moving the oversail of Ruffian's Wood away from the centre of the area used by the commercial business. In addition, consideration has been given to construction access routeing (see Section 6) and reducing the period during which construction activities would restrict business activities across part of the site to when vegetation management and conductor stringing activities only are occurring.

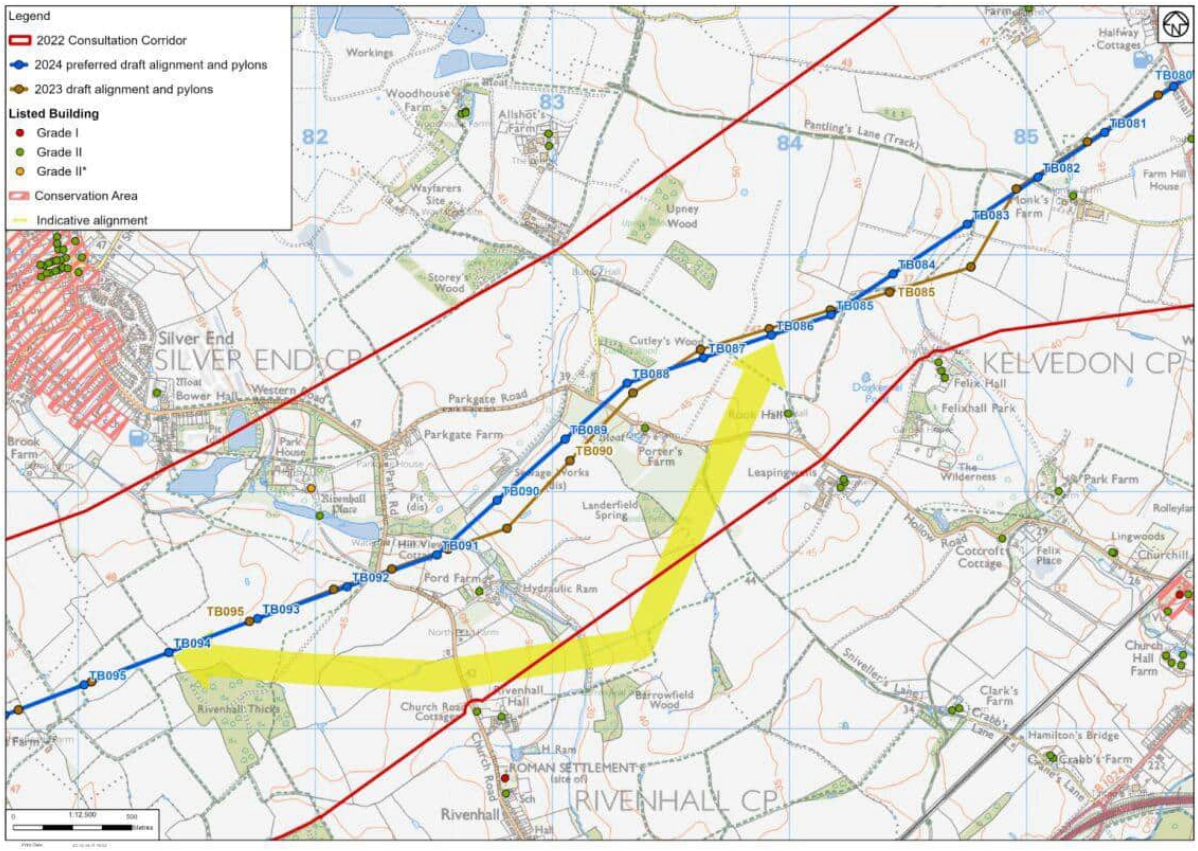
5.4.165 The change also positions pylons in the section to the southeast of the wood closer to the field boundary going someway to respond to feedback. Placing the pylons directly on the field boundary would require the introduction of two additional angle pylons, lead to greater loss of trees (overall therefore being less consistent with the Holford Rules) and lead to oversail of a road junction which presents greater risk to construction and maintenance activities to install protection to keep the roads open. This is therefore less preferred.

5.4.166 The realignment to the south-west of Ruffian's Wood also facilitates a response to feedback about the proximity of TB093 (in the 2023 preferred draft alignment) to a residential property on Park Road to the north of the pylon. With the change of alignment, it has been possible to increase the separation from the property to the nearest pylon from just over 80 m to around 200 m, by moving pylons along the alignment.

5.4.167 A further alternative raised in feedback (see Figure 5.23) to move the alignment (at TB92 to TB93 on the 2023 preferred draft alignment) slightly further south has also been considered. With the 2023 preferred draft alignment this would have added a number of additional angle pylons to route around various residential properties and was less preferred for this reason. The change to the 2023 preferred draft alignment makes the requested change easier to achieve by continuing the alignment straight on from TB091

(2024 preferred draft alignment) though it still requires one additional angle pylon to reconnect to the south. This alternative would also transfer effects to a different residential property on Church Road to the south-east and would position a pylon on land proposed for solar panels on the proposed Park Gate solar farm (noting that at the time of writing, confirmation was awaited of a possible appeal to planning refusal). On the basis of the greater effects, mostly related to the solar farm) the alternative is considered less preferred. The proposed draft order limits have however been extended in this location to allow for a further small adjustment to the alignment, which would also allow reduction of effects on a group of trees, should the solar farm not progress.

Figure 5.23 Alignment to east of Rivenhall



Rivenhall to Fairstead and 400 kV overhead line crossing – Section E

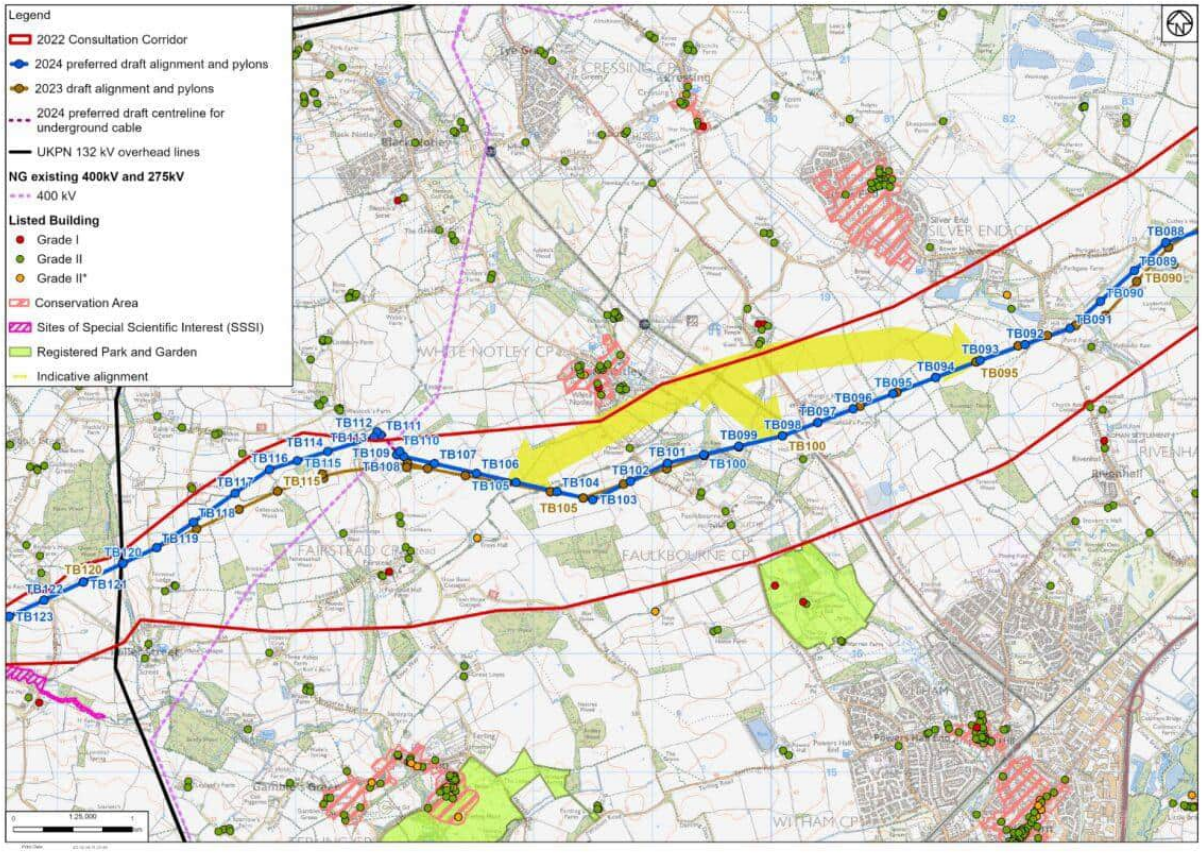
5.4.168 Continuing within Section E, feedback from respondents requested consideration of various alternatives seeking to move the alignment further to the north of Faulkbourne (see Figure 5.24), in particular proposing alignments that would pass close to the immediate south of White Notley and / or Cressing Temple. Although there would be a reduction in visual and heritage effects to Faulkbourne Hall and certain residential and / or listed properties from such alternatives, they would also lead to a transfer of effects to other receptors. This includes transferring effects to a greater number of other similar residential properties or heritage assets (including similar grade listed buildings and a scheduled monument) and in some cases were considered likely to lead to a greater magnitude of effect. Alternatives here were also considered to be less consistent with the Holford rules and overall were not preferred.

5.4.169 In addition, the potential effects at Faulkbourne were not considered to be inconsistent with policy and therefore do not provide a driver to change what is otherwise a relatively

straight alignment approximately midway between Cressing Temple and Faulkbourne listed buildings.

5.4.170 An oversail, by the 2023 preferred draft alignment, of the corner of a pitch (see Figure 5.24) and specifically the western goal posts to the south-east of White Notley has been identified. Whilst any potential microshock risk could have been mitigated through the use of plastic goalposts, it was considered there was a residual concern that future replacements may inadvertently overlook the potential risk. The angle pylon has been moved and is now positioned at TB101 (on the 2024 preferred draft alignment) with the degree of direction change slightly increased to avoid the oversail of the goal (removing the microshock risk) whilst not moving the alignment closer to residential properties to the west side of Church Hill.

Figure 5.24 Alignment at White Notley and Fairstead



5.4.171 At the crossing of the existing 400 kV overhead line to the north of Fairstead, feedback requested the repositioning of the western CSE compound, and overhead line routeing, to reduce interaction with multiple game shooting drives and reduce potential effects on plantation willow along the floor of a shallow valley.

5.4.172 Consideration was given to moving the CSE compound further west (to or beyond TB115 on the 2023 preferred draft alignment) this was less preferred. Whilst such changes would remove the conflict with game shooting it was considered that the increased length of underground cable required (a minimum of around 400 m) and thus increased cost was not justified for the effects addressed nor in line with National Grid's duties to be economic and efficient.

5.4.173 A further alternative, moving the 400 kV alignment to the north of woodland at Hallhook Row (north of TB113 to TB115 on the 2023 preferred draft alignment) has been considered, albeit in a slightly modified form to that proposed by a respondent. Although

the feedback suggested moving the CSE compound to the north, there was no appreciable extent of existing screening vegetation. Feedback was however addressed by moving the CSE compound further north-east immediately adjacent to the 400 kV overhead line. This alternative position and associated overhead line realignment further to the north, would avoids the plantation willows and allow both CSE compounds to be positioned within the same field to the east of the shallow valley and Fairstead Road. In this location landform and existing woodland and hedgerow screening, which can be further strengthened, would help to reduce the level of potential effects.

5.4.174 This location would also reduce the length of underground cable crossing required, providing a more economical solution, and also reducing the potential for effects to arise from underground cable installation. The alternative does however, compared with the 2023 preferred draft alignment, move the overhead line closer to a residential property (also a Grade II listed building) at Westock's Farm albeit that there would still be still provides around 300 m separation from the nearest pylon or CSE compound infrastructure. Overall, this alternative, western CSE compound position and associated realignment of the overhead line that continues to the west, is preferred and has been taken forward in the 2024 preferred draft alignment.

5.4.175 As a consequence of the repositioning of the western CSE compound, a slight western shift of the eastern CSE compound and overhead line is required between TB105 and TB118 (now identified as TB103 to TB119 respectively in 2024) to optimise the CSE compound positioning and reduce effects.

Fuller Street to Writtle – Section F

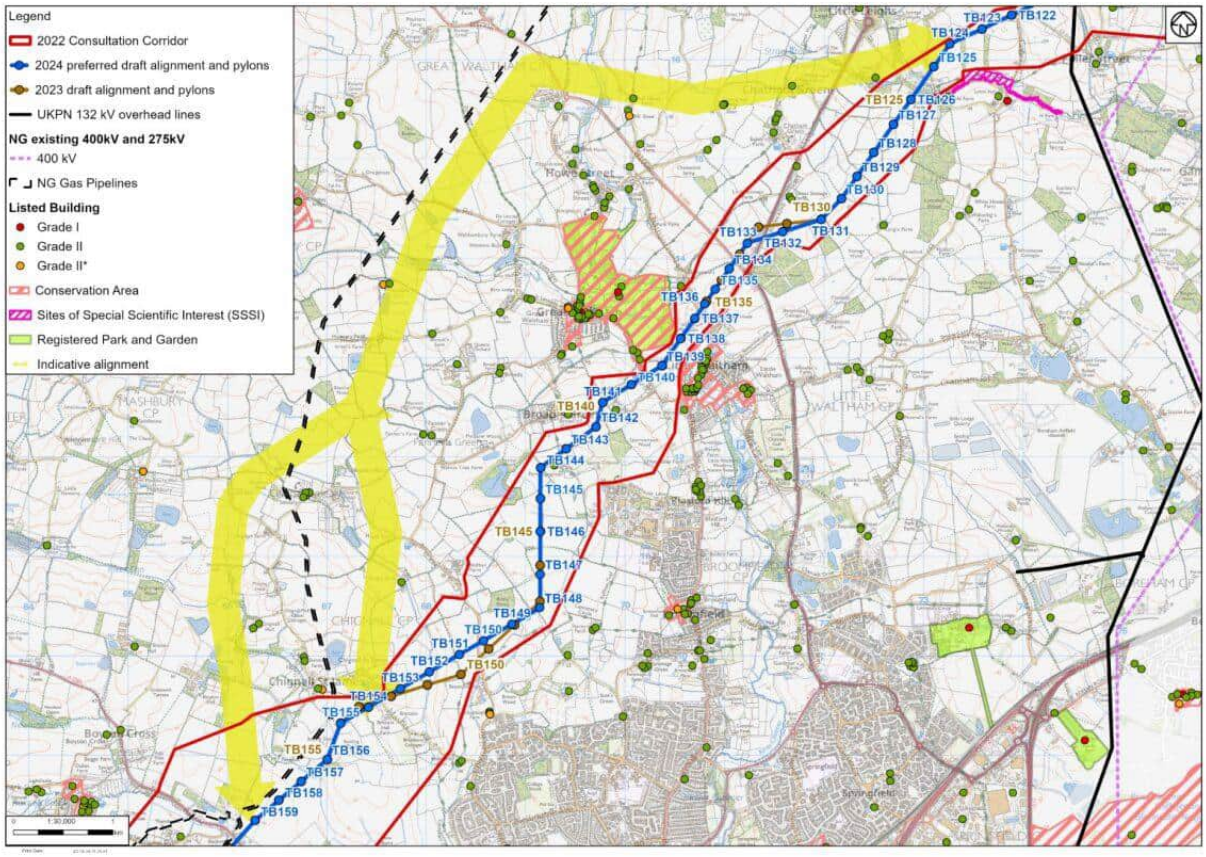
5.4.176 Section F commences around the point that the alignment crosses the 132 kV overhead line at Fuller Street. As the design for the Project has developed, we have been able to confirm certain arrangements where the Project interacts with the existing 132 kV overhead line network. The usual arrangement is to replace the 132 kV overhead line with underground cable between CSE platform pylons. These CSE platform pylons are provided by re-purposing or new 132 kV pylons positioned to either side of the 400 kV alignment. This arrangement is normally kept as short as technical considerations allow to reduce environmental effects of the underground cable installation and to be as economic as possible whilst achieving safe crossing of this infrastructure.

5.4.177 At Fuller Street the 2023 preferred draft alignment would position 400 kV pylons to north and east of the village with additional potential cumulative effects with the 132 kV overhead line to the west. Considering the potential cumulative effects, it is proposed to underground a relatively more extended length of 132 kV overhead line from alongside Mann / Parson's Wood on the north side of the existing 400 kV overhead line to the south of Fuller Street to the south of the existing 400 kV overhead line.

5.4.178 Landowner feedback identified aspirations for mineral extraction and housing development to the north of Chelmsford, with sites reported to have been put forward as part of 'calls for sites' in the planning process. A number of alternative alignments were suggested to avoid the areas concerned but all would be longer and less direct than the 2023 preferred draft alignment. All would also increase effects, compared with the 2023 preferred draft alignment, to varying degrees on woodland, residential amenity, and heritage assets. Irrespective of this however, and in line with the approach set out from paragraph 5.4.4, the proposals are not considered (at the 31st December 2023 cutoff date for this report) to be at an advanced enough stage in the planning process to be included as a material factor influencing route development considerations. The alternatives suggested have not therefore taken forward at this stage.

5.4.179 Several respondents restated their preference for a more western alternative towards Pleshey (see Figure 5.25) though identified no new factors nor change to material considerations to support their preference. National Grid has backchecked and has considered an alternative that would divert west from around TB124 / TB125 on the 2024 preferred draft alignment passing to the north of Warner's Farm before turning southwards. Routeing would be likely to stay to the east of the gas pipeline to maintain separation from Pleshey. Alternatives to pass Chignall Smealey and Chignall St James either to the east or west may be available with a preference to pass to the west as a more direct alignment.

Figure 5.25 Alignment at Great Waltham



5.4.180 This more western alternative, regardless of route at the southern end would lead to some transfer of effects on residential amenity. Routeing to the southern end of The Crescent near Little Leighs is relatively restricted and would pass at around 100 m from residential properties. In this area the route would also need to cross part of the land used by The Wilderness Foundation for outdoor education including in part for short residential educational camps. Some disruption during construction likely to be unavoidable.

5.4.181 The western alternative would also be visible in the open farmland from several residential properties to the west edge of Great Waltham which have open views towards Pleshey, and where there is little in the way of existing screening vegetation.

5.4.182 Elsewhere both the western alternative and the 2023 preferred draft alignment would pass relatively close to properties, though many of those in Great and Little Waltham along the 2023 preferred draft alignment would have substantially screened or filtered views. Overall effects on residential amenity are considered to be slightly greater on the 2023 preferred draft alignment.

5.4.183 The western alternative would offer the opportunity to reduce potential heritage effects as it is routed, at least in the central third, through cropped farmland where there are relatively fewer listed buildings. It would however introduce the potential for additional effects to a scheduled monument east of Howletts and, given the relative openness of views between Pleshey and Great Waltham, may introduce effects to the scheduled monument (motte and Bailey of Pleshey Castle) and listed buildings at Pleshey. The 2023 preferred draft alignment routes between conservation areas and past the eastern edge of the Langleys Registered Park and Garden, though screening by the bypass and from trees would reduce potential effects on Little Waltham. In addition, the trees in the extensive parkland would provide filtering of views at Great Waltham and to direct views from the Grade I Listed Langleys. Overall heritage effects are likely to be reduced with the western alternative.

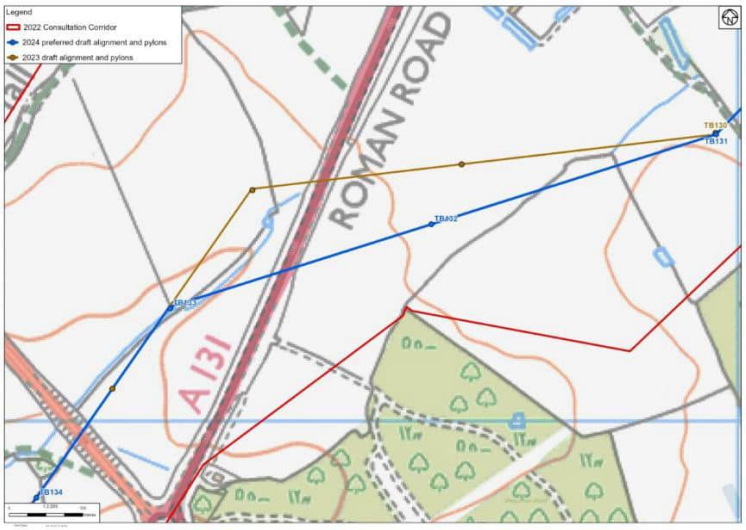
5.4.184 The western alternative would be in the order of 2.5 km to 3 km longer and likely to require an additional 8 or 9 pylons with associated additional environmental effects. It would also require an additional crossing of the gas pipeline and may necessitate additional installation of cathodic protection (trenches adjacent to the gas pipeline need to be dug to install the protection) over several kilometres, leading to additional effects on farming activities.

5.4.185 Whilst noting the potential for some reduction to some effects (heritage and residential amenity) from the western alternative. it is noted that the alternative would lead to some transfer of effects from some residential properties to others and would introduce effects and require additional infrastructure over a less direct and longer route.

5.4.186 With the potential effects on the 2023 preferred draft alignment not considered to be inconsistent with relevant policies in NPS EN-5 it is considered that on balance the shorter alignment of the 2023 preferred draft alignment is appropriate to take forward into the 2024 preferred draft alignment.

5.4.187 Heading onwards from TB130 and the crossing of the proposed Chelmsford Northern Bypass, minor adjustments to the 2023 preferred draft alignment are proposed to reposition the crossing of the A131 (see Figure 5.26) and some pylons to the east of Langleys Park and Garden to seek to reduce pylon heights and position pylons to reduce effects on farming activity, conservation areas, heritage assets and landscape.

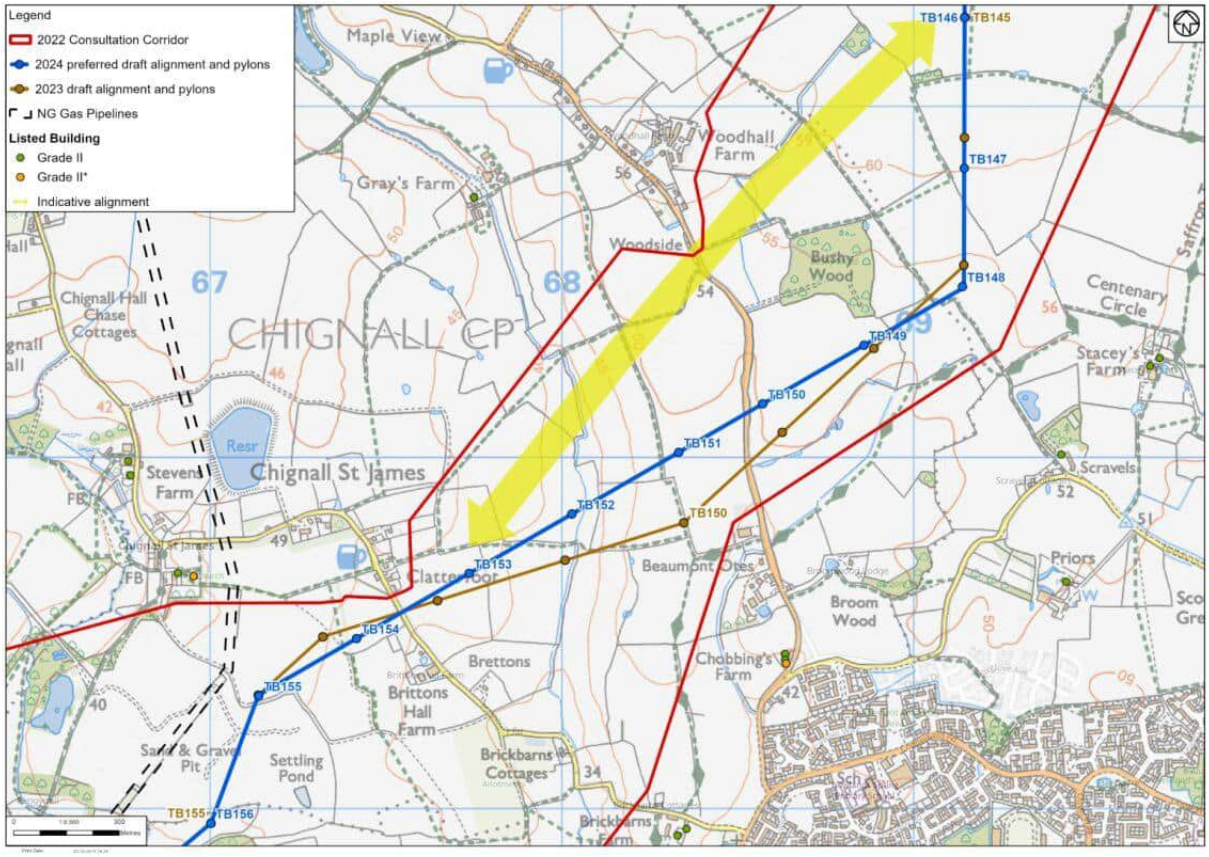
Figure 5.26 Alignment at A131 crossing



5.4.188 To the west of Broomfield, in response to feedback, the 2023 preferred draft alignment has been straightened between TB148 and TB155 (identified as TB147 and TB154 respectively in 2023) (see Figure 5.27) replacing four angle changes with two slightly greater angle changes.

5.4.189 A preference for an alternative alignment was restated by respondents seeking to move the alignment to the north of Bushy Wood by adopting a straight alignment broadly between TB146 and TB153 (on the 2024 preferred draft alignment). This alternative would lead to increased effects on residential properties on Woodhall Hill where separation to the draft alignment would be reduced to around 150 m. Following the straightening from TB147 to TB155 (2024 preferred draft alignment) noted above, separation to properties to the south is currently in excess of 350 m with the separation to the properties to the north slightly greater at around 450 m. A midway alignment cannot be achieved due to the constraint of the ancient woodland at Bushy Wood. In the absence of other or additional factors and no new material considerations being identified it is considered that an alternative to the north of Bushy Wood is less preferred and it has not been taken forward.

Figure 5.27 Alignment north of Broomfield



5.4.190 Feedback relating to land to the north-west of Writtle (see Figure 5.28), to the south of Brittons Hall Landfill, requested avoiding a site used for a scouting and guiding Jamboree every four years, suggesting it could be addressed by alternatives diverting to either east or west.

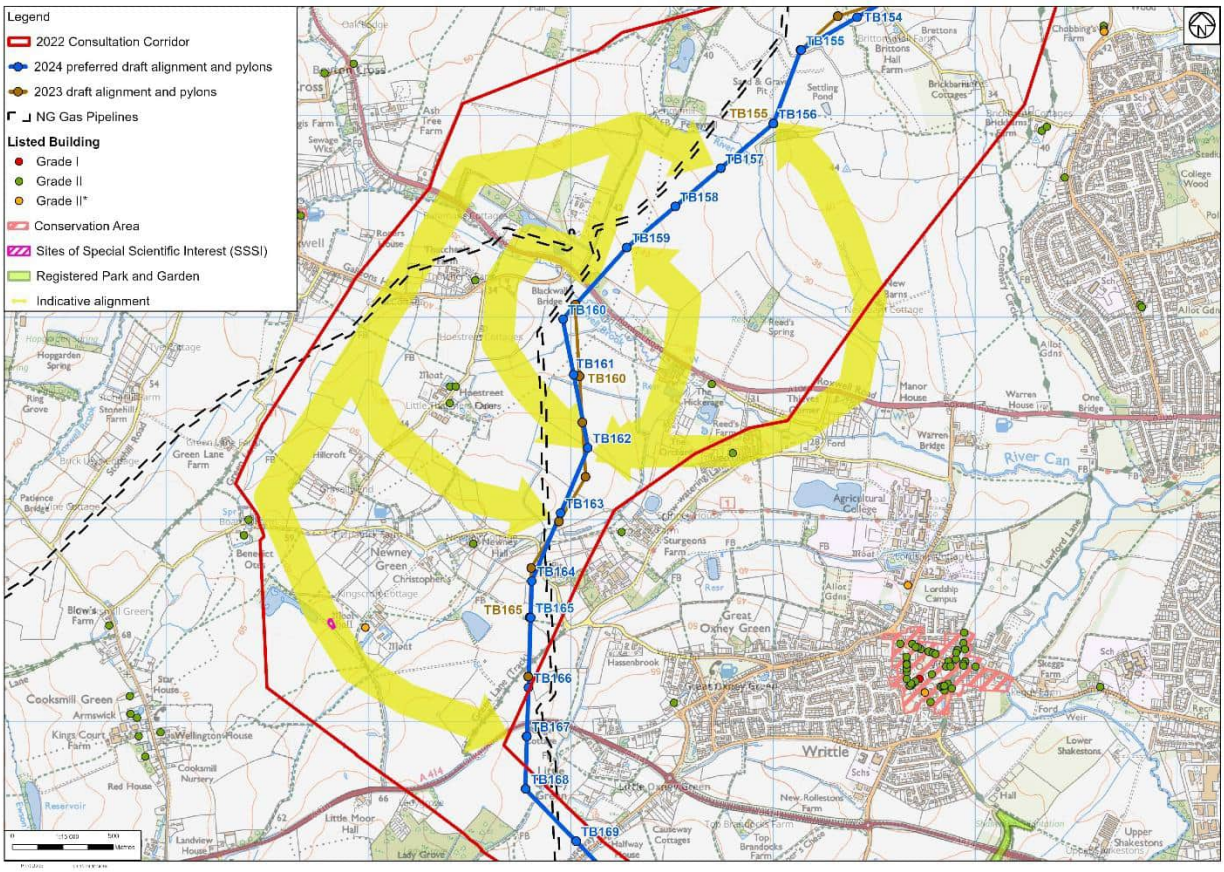
5.4.191 An alternative diverting to the eastern edge of the site would adversely affect land identified as a Strategic Growth site, as well as having to cross Roxwell Road between The Hickerage and Thieves Corner. At this location changes of direction would be required and the space between residential properties would be considerably reduced.

Effects on residential amenity are therefore considered to be greater than for the 2023 preferred draft alignment. An alternative diverting to the west of the Jamboree site and a gas compressor site was considered in the development of the 2023 preferred draft alignment and has been back checked following feedback. Such an alternative would result in a greater number of properties likely to experience effects on residential amenity than for the 2023 preferred draft alignment and it is therefore less preferred. As the oversail of the jamboree site by overhead line is not considered to be incompatible with its use for periodic jamboree events, and in the absence of other or changed factors or material considerations, it is considered that more eastern or more western diversions are less preferred to the 2023 preferred draft alignment.

5.4.192 Other potential alternatives achieving localised realignments across the Jamboree site to follow the east or west boundaries were also considered. However, these would all be longer, add additional angle pylons and still oversail the site to some degree. On this basis the straighter 2023 draft alignment remains preferred.

5.4.193 Feedback also requested consideration of an alternative deviating from the 2023 preferred draft alignment close to the gas compressor site to pass immediately to the west of the Hare public house. The gaps between properties would however be reduced and there would be a transfer of and increased effects on residential amenity compared with the 2023 preferred draft alignment. Requests for other alternatives further west were also repeated from the 2022 consultation but, as identified in the 2023 Design Development Report these would require much longer routes with greater angle changes and the transfers of effects to a larger number of residential properties. These therefore continue to remain less preferred. On balance therefore the 2023 preferred draft alignment continues to be considered preferable to other alternatives and has been taken forward.

Figure 5.28 Alignment west of Writtle



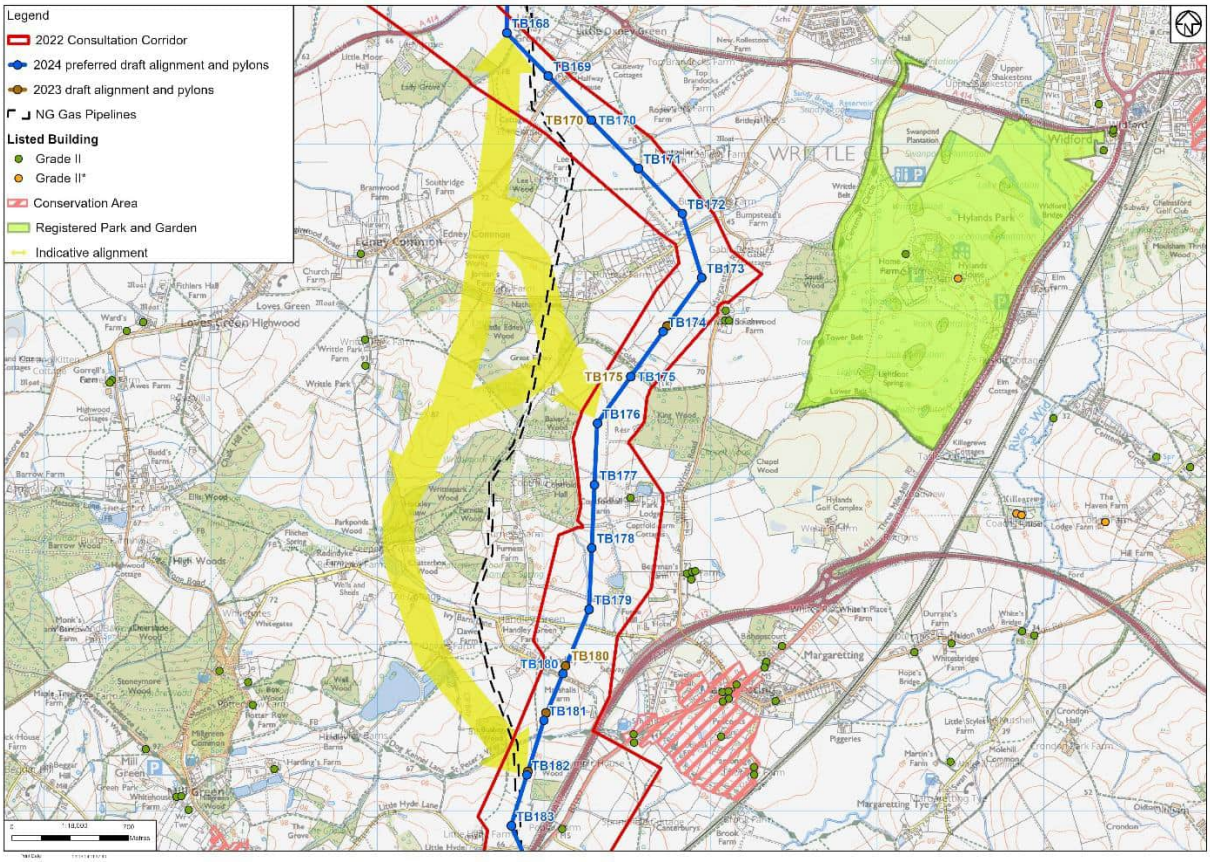
Writtle to Herongate – Section F and Section G

5.4.194 The Project continues in Section F until the crossing of the A12 north of Ingatestone where it moves into Section G.

5.4.195 Minor adjustments have been made in the positioning of TB159 to TB164 (2023) now TB160 to TB164 in the 2024 preferred draft alignment. This has increased the distance between TB160 (which has also now moved out of a flood zone) and the nearest residential properties and has also sought, where possible, to position pylons to reduce effects on farming activity, at least partly achieved by removing one pylon.

5.4.196 Feedback also requested routeing more directly in the vicinity of Edney Common (e.g. TB158 to TB176 or TB182) to reduce effects on farming activity, and potentially also benefitting from routeing more extensively in valleys (see Figure 5.29). Feedback emphasised that several areas of Ancient Woodland, that were identified as a main reason for these routes being less preferred in the 2023 Design Development Report, were subject to extended rotation coppice regimes. After reconsideration it has been concluded that the more regular need to control the height of vegetation under overhead lines (requiring coppicing over short rotations) would lead to a change in the habitat. This change is not considered to be compatible with the preservation of the ancient woodland habitat and these alternatives are still considered to be less preferred. As such we are currently progressing with the 2023 preferred draft alignment in this location but with some in line adjustments to pylon positioning.

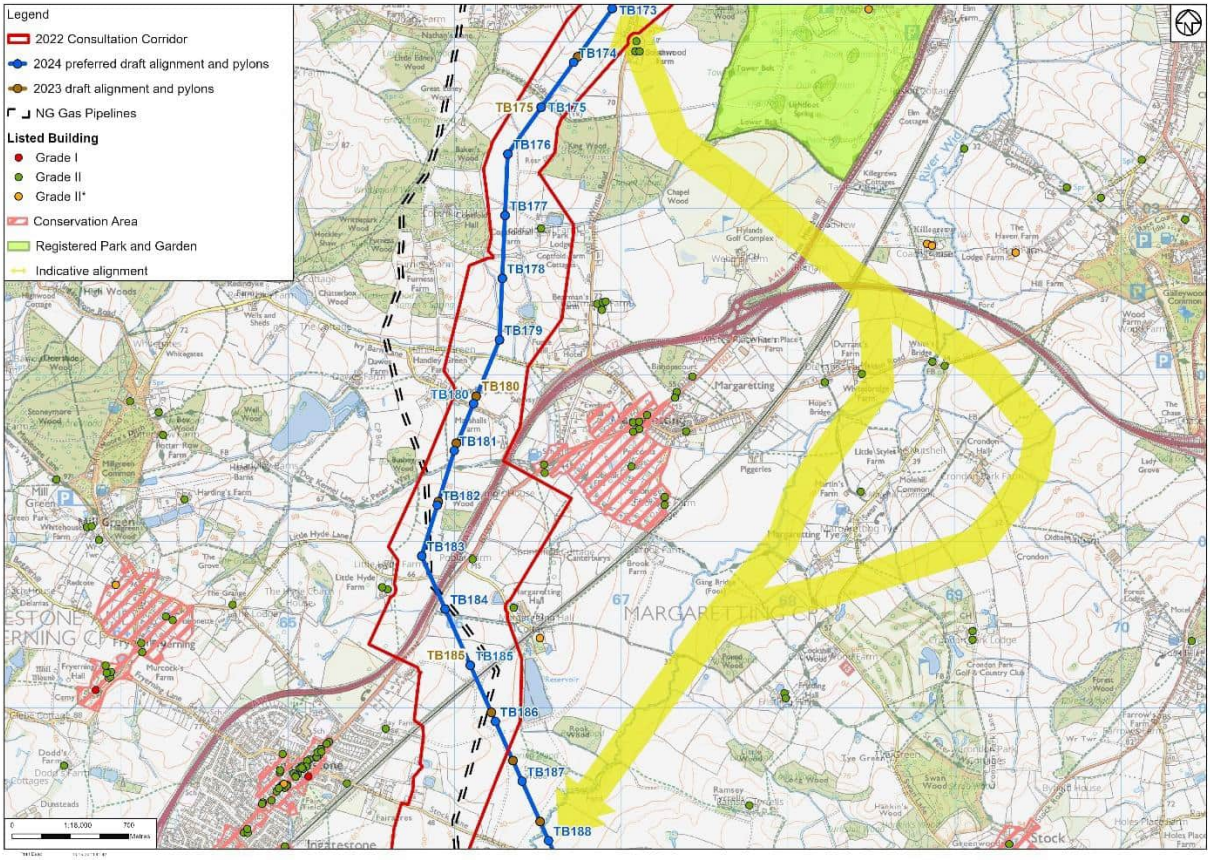
Figure 5.29 Alignment at Edney Common



5.4.197 Feedback responses also proposed an alternative alignment to the east of Margaretting (see Figure 5.30). This would be from around TB175 to pass the southern edge of Hylands Park and directly over Hylands Golf Complex. Crossing the rail line to east of the

A12 and A414 junction the alignment would turn south along the east side of the River Wid reconnecting with the 2023 preferred draft alignment to the east of the Church of St Mary at Buttsbury. Localised variations were considered for part of the alternative passing to the east and west of a group of properties located along Swan Lane. Overall, the alternatives would be around 1 km longer, (for the shortest western alternative and longer than a variation passing to the east of Swan Lane) and less direct with a much larger angle change around the A12 crossing. Effects on residential amenity and heritage assets would generally be transferred from receptors around the 2023 preferred draft alignment to receptors on these alternatives. Additionally, there would be increased levels of residential amenity effects for the alternative passing to the west of Swan Lane, as a result of an increased number of properties in closer proximity to potential alignments in the area around Maldon Road and Swan Lane. Due to the increased level of effects and the longer route length these alternatives are less preferred and have not been taken forward.

Figure 5.30 Alignment at Margaretting & Ingatestone



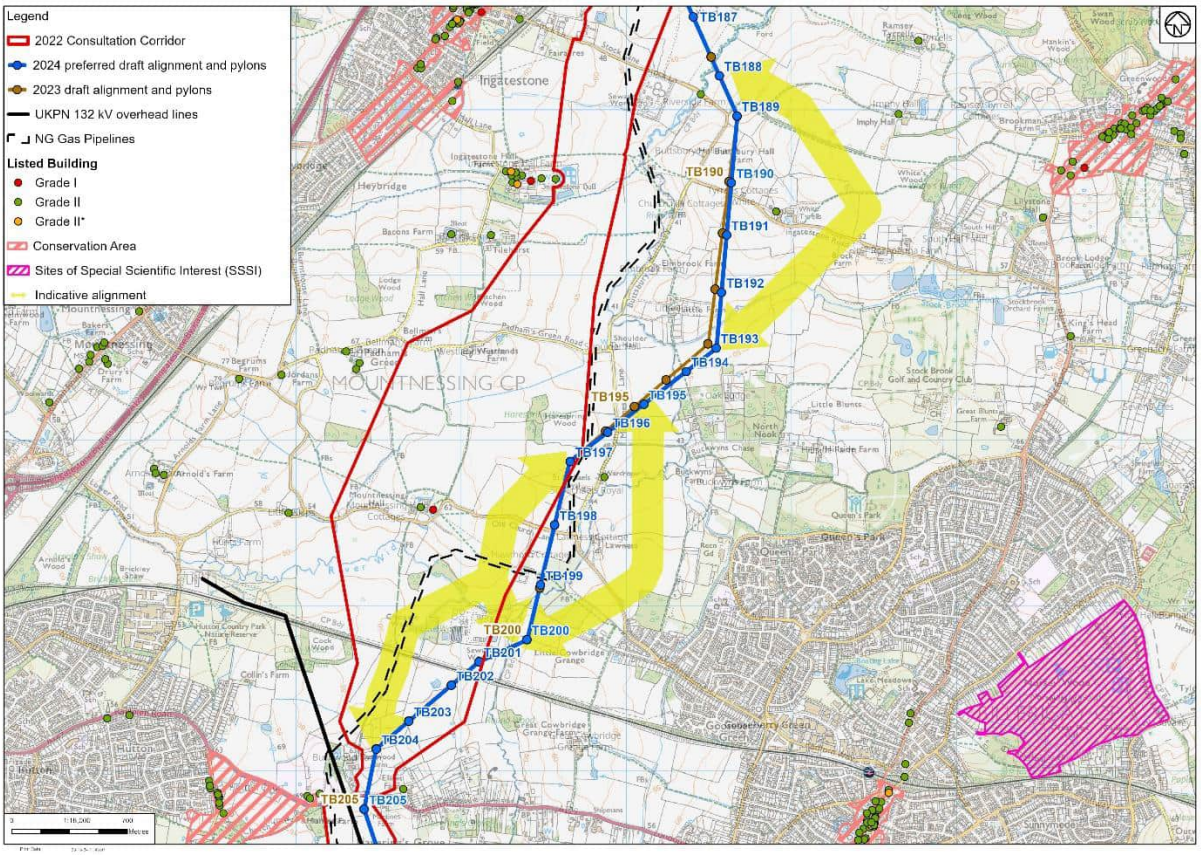
5.4.198 The Project moves into Section G around the crossing of the A12 to the north of Ingatestone.

5.4.199 Consideration of feedback and further technical review have led to a slight shift eastward in the alignment (see Figure 5.31) between TB189 and TB197 (identification unchanged since 2023) to reduce oversail of an animal rescue establishment and avoid the placement of pylons within flood risk areas. The potential for interaction with Napps Field Airfield (also referred to as Brock Farm) was also identified by respondents but, through engagement with the landowner, it has been identified that this airfield is no longer operational, and the owner has no current plans to restore flight activities.

5.4.200 Respondents also sought consideration of alternative alignments further to the east, in the vicinity of White Tyrrells, partly from landowner perspectives but also to increase the separation from the Grade II* Listed Buttsbury Church. Such changes would reduce heritage effects but would transfer effects to other landowner receptors. It would also be requiring a less direct and longer route with additional pylons and would increase effects on residential amenity to those on the western edge of Stock. Overall, given the transfer of effects and increased length and number of pylons, it is considered that a change would be less consistent with the Holford Rules and therefore it was less preferred, and no change is currently proposed.

5.4.201 Conflicting feedback was provided for the section to the east of the Grade I Listed St Giles Church (see Figure 5.31) with respondents seeking to reduce residential amenity effects or reduce effects on an area recently planted with saplings as part of restoring wildlife interest. Some respondents proposed a move of the 2023 preferred draft alignment further east but this is considered less preferred, as while there would be some benefit to individual residential amenity, there would be a transfer of effects and an increase in such effects to a larger number of residential properties on the western edge of Billericay.

Figure 5.31 Alignment at Stock



5.4.202 Other respondents proposed alternatives to address the potential effects that sought to move the alignment further to the west (closer to, but still to the east of St Giles Church) encompassing various routes past the Wastewater Treatment Works (WwTW). Alternative routes over the WwTW are not viable as they would interfere with the essential need for cranes to be used on the site. Alternative routes to the west of the WwTW would position pylons much closer to the Grade I Listed St Giles Church and impacting the setting of the Church. These alternatives are therefore considered less preferred. Alternative routes close to the western edge of the WwTW would also unavoidably affect areas of ancient woodland and are therefore also less preferred.

5.4.203 A further alternative continuing southwest from TB197 and passing to the west of residential property and the gas installation before turning to pass to the east of the WwTW reconnecting with the 2023 preferred draft alignment around TB200 was also considered as a hybrid option. Whilst this would avoid the removal of the recently planted trees, it would result in increased heritage effects, when compared with the 2023 preferred draft alignment, as a result of reduced separation from the Grade I Listed St Giles Church, with a less direct alignment with more angles and greater direction change particularly at TB200. Taken together this alternative was considered as less preferred.

5.4.204 No change to the 2023 preferred draft alignment in this area has therefore been taken forward.

Herongate to South of Dunton Hills Garden Village – Section G

5.4.205 Continuing in Section G, feedback requested avoidance of the pinchpoint to the west of Havering's Grove around TB205 but without defining a specific alternative. This is not possible however due to the extent of urban areas (Billericay, Hutton, Brentwood amongst others) to the east and west restricting options for routeing to Tilbury. No change is proposed in response to this feedback.

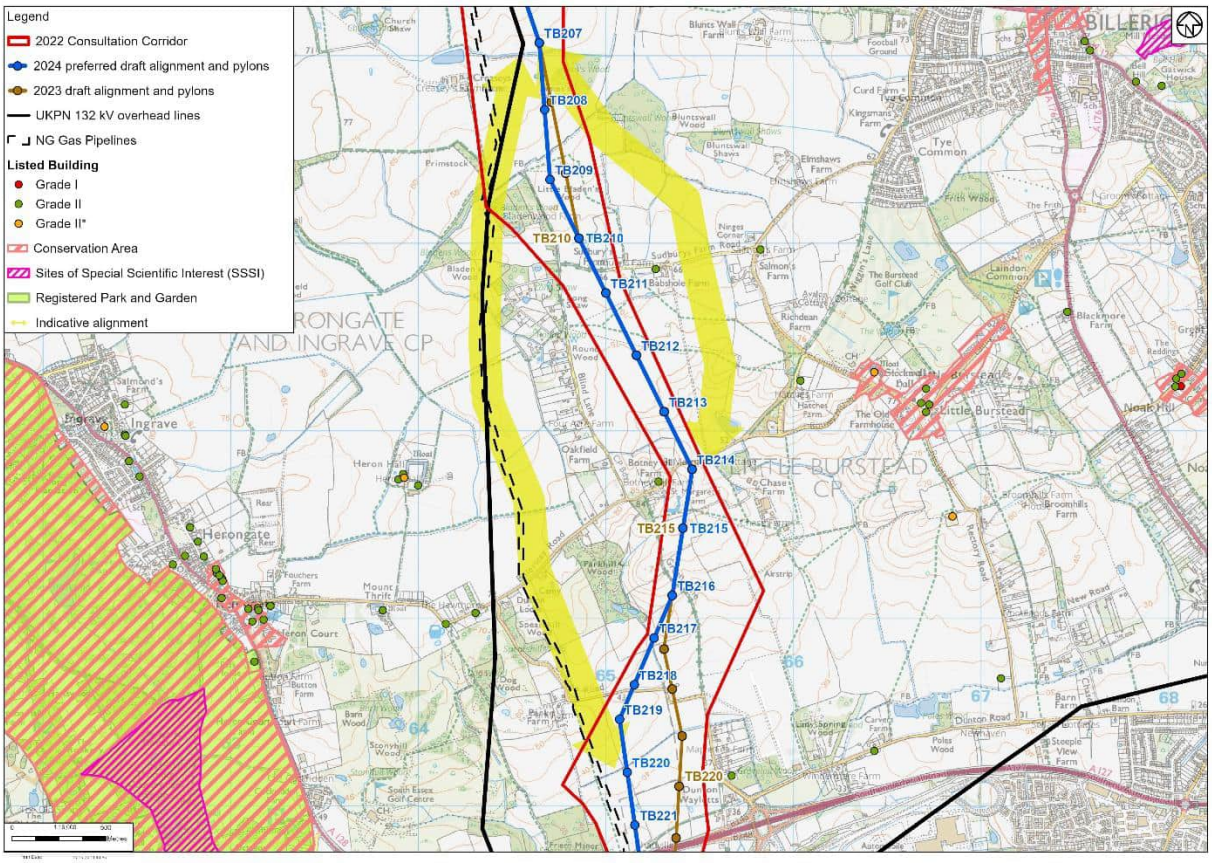
5.4.206 Feedback also suggested an alternative for routeing at the pinchpoint by adopting the route of the 132 kV overhead line (replacing the 132 kV overhead line with an underground cable) (see Figure 5.32). Whilst the potential for this to reduce residential amenity effects around this location is noted, this would be as a result of either increased ecological effects, due to the requirement for a swathe of tall vegetation to be cleared through woodland or would require oversail of the Woodland School grounds. The adoption of the alignment of the 132 kV overhead line are considered less preferred to the 2023 preferred draft alignment.

5.4.207 A conclusion has not yet been reached as to whether the cumulative effects on residential amenity, to the residential properties at and on the road to Bushwood Farm, of a 400 kV overhead line to one side and the 132 kV overhead line to the rear necessitate consideration of any additional mitigation. This could potentially include replacement of the 132 kV overhead line by underground cable.

5.4.208 South of Herongate, feedback requested consideration of alternatives that either adopted or close paralleled the existing 132 kV overhead line that passes to the west of Blind Lane. As shown on Figure 5.32, respondents cited in particular their opinion that there was space to the western side of the Herongate Woodland Cemetery that could be used for the 400 kV routeing. This suggestion has been reviewed however the perceived space, adjacent to the western side of the cemetery, has been identified a being occupied by a high-pressure gas pipeline with space further restricted by an adjacent residential property. The particular arrangement of the gas pipeline and residential property, along with areas of woodland, is such that an alignment for a 400 kV overhead line cannot completely avoid oversail of the cemetery area. This is not considered to be consistent with the Holford Rules and planning policy and is therefore less preferred.

5.4.209 The alternative to adopt or closely parallel the existing 132 kV overhead line, which is positioned slightly further west of this, is also restricted by various environmental features and constraints. To the west of the woodland cemetery the 132 kV overhead line passes between residential properties. The larger scale 400 kV infrastructure is more likely to oversail in this location. It would also lead to effects on the South Essex Golf Centre and lead to increased effects on the scheduled monument 'Moated site east of Heron Hall'. For these reasons it is considered that an alternative adopting or closely paralleling the 132 kV overhead line is less preferred.

Figure 5.32 Alignment at Herongate



5.4.210 In response to localised feedback to seek to reduce effects on residential amenity in the vicinity of TB210, the angle pylon to the north has been moved by one span, to TB209. Although the position of TB210 has not changed the larger angle pylon has been moved further from the closest residential properties.

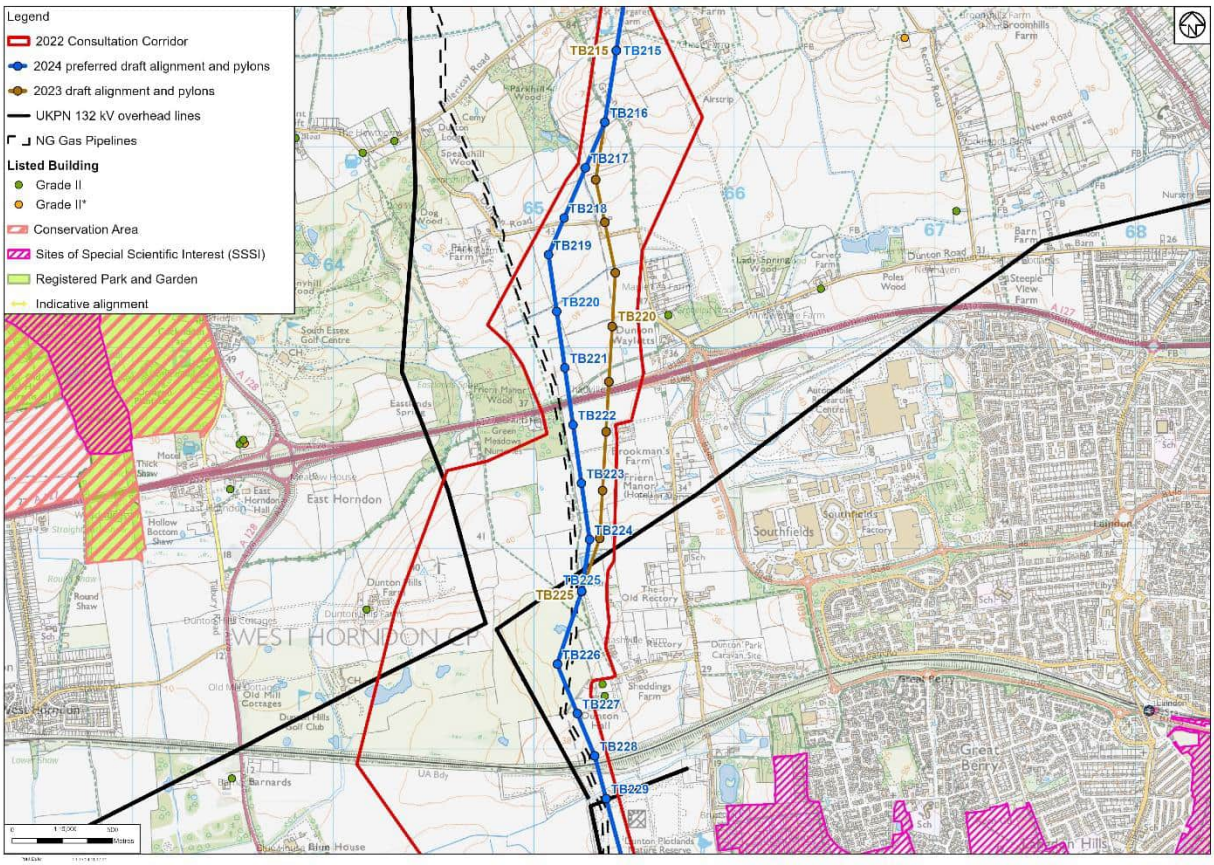
5.4.211 Feedback also identified additional housing proposals to the east of Dunton Hills Garden Village, with part of the proposals to the west of the gas pipeline and a larger part to the east. Based on an indicative masterplan provided in the feedback, the proposals would be potentially impacted by pylons TB221 to TB224 within the 2023 preferred draft alignment (see Figure 5.33).

5.4.212 An opportunity has however been identified that would reduce interaction with the Dunton Hills Garden Village proposals. This would assist with reducing the effects on the proposals to the east of the garden village site as the indicative masterplan also shows the provision of a corridor formed by the Building Proximity Distance (BPD), which provides a safety zone around the gas pipeline, to be kept free from occupied buildings. An alternative to follow this corridor would reposition the 2023 preferred draft alignment northwards from TB225 to closely follow the gas pipeline and would routeing within the safety zone. The zone restricts the new development to being in the order of 80 m distant from the pipeline (the BPD has been confirmed with Gas Transmission and Distribution who are the owner and operator of this pipeline). This alternative would increase the potential for interaction with the Park Farm Solar development though through detailed engagement and micrositing it is considered that the potential loss of panels can be minimised. On balance this alternative is preferred and, subject to detailed design outcomes, we would expect loss of developable land to be minimal and effects arising from proximity being reduced through design orientation and planting.

5.4.213 As a consequence of the change described above, the connection to the north back to the 2023 preferred draft alignment is realigned to the north of the A127 around TB216. This allows some repositioning of the alignment to seek to reduce the interaction with flight activity at Chase Farm airstrip. Even with the realignment some interaction with flight activity remains and requires consideration of additional measures to allow future use. National Grid is continuing to engage with the airstrip operator to seek to identify an appropriate solution.

5.4.214 Feedback has also requested consideration of underground cables through the Dunton Hills Garden Village development area. The route of any cable connection would be likely to have to adopt the 2023 preferred draft alignment to cross the A127 as there is insufficient space for the majority of the required cable trenches between a residential property and the gas pipeline to allow for trenchless crossing for all the cables. Even if realigned to subsequently follow the gas pipeline safety zone it is estimated that between 2 to 3 hectares of development land would be removed (as no development could occur above the cables). Given the absence of a clear basis in NPS EN-5 for the use of underground cable in this location (it is not subject to designation as AONB or similar), the ability for detailed masterplanning to reduce potential visual effects and the additional cost implications of the additional cable (of around a minimum 2 km), and the potential loss of development land National Grid does not consider it necessary to change from overhead line for the 2024 preferred draft alignment in this location.

Figure 5.33 Alignment at Dunton Hills Garden Village



Dunton Hills to Lower Thames Crossing – Section H

5.4.215 The Project crosses into Section H at the railway line to the south of Dunton Hills Garden Village. South from Dunton Hills no substantive modifications to the 2023 preferred draft alignment or pylon positioning have been made.

5.4.216 Feedback suggested continuing the parallel arrangement with the 132 kV overhead line in the vicinity of Langdon Hills Golf Course where the 2023 preferred draft alignment deviates from a parallel arrangement between TB235 and TB243. This alternative parallel arrangement has been considered but it has been concluded that this would conflict with continued flight activity at Thurrock airstrip to the west. It was therefore less preferred.

5.4.217 We have continued to review the 2023 preferred draft alignment following engagement with the airfield and some in-line modifications have been made to the proposals. Pylon separation has been reduced (by introducing an additional pylon between TB235 and TB240) to keep pylon heights lower and, by maintaining the positioning closer to Langdon Hills Golf Course, flight activities at Thurrock can continue.

5.4.218 In this area towards the southern corner of the golf course, feedback suggesting crossing pipelines at closer to a right angle was also considered. This would require more, and sharper, angles (potentially leading to conflict with Thurrock Airfield activities) and it is considered that concerns relating to more oblique crossings can be addressed through other mitigation measures (including the installation of cathodic protection) to protect the pipelines. On balance therefore the 2023 preferred draft alignment has been taken forward with its fewer and less sharp changes of direction.

5.4.219 Respondents also requested consideration of alternative alignments so that the alignment between TB248 to TB254 be moved to pass to the west, either to follow the 132 kV overhead line, or alternatively, to pass to the western side of Saffron Gardens, noting that Cholley's Farm (a Grade II Listed building) was in their opinion derelict. In the absence of new evidence, the reasons for not preferring a route close to or adopting the 132 kV overhead line, as set out in the 2023 Design Development Report, which are that there is insufficient space between residential properties as well as constraints from previous minerals and landfill workings and the routeing of a gas pipeline, remain valid. On this basis this alternative is less preferred, and this requested change has not been progressed.

5.4.220 A proposed alternative to the west of Saffron Gardens was also considered. It was identified that routeing would be constrained by the presence of a gas pipeline which would necessitate potential alignments that were either closer to areas of residential properties and listed buildings, such as Saffron Gardens, or would require the use of multiple angle pylons to achieve similar separation as the 2023 preferred draft alignment. It would also require a very substantial angle change at around TB253. Overall, these western alternatives are considered less consistent with Holford Rules and have not been taken forward.

5.4.221 Wider draft order limits are proposed around Buckingham Hill Landfill in response to feedback from respondents to seek to avoid Maple Park (moving TB256 and TB257 to the west of the road). Investigations and engagement with respective landowners continue to identify an appropriate balanced solution, pending confirmation of potential SSSI designations, built development proposals at Southfields and ground conditions. Some interaction with the southern end of the Southfields development opportunity site cannot be avoided, given the absence of alternative alignment options. However as at Dunton Hills, the routeing of a high-pressure gas pipeline and its associated safety zones provides an opportunity to minimise interaction between the Project and the potential for development of this site.

Lower Thames Crossing to Tilbury

5.4.222 No substantive changes to the proposed CSE compound siting or underground cable corridor for the connection through to Tilbury Substation are proposed however the draft order limits have been expanded to support all reasonably likely outcomes from ongoing discussions with landowners and other development promoters regarding the integration of proposals most efficiently and economically.

5.4.223 The most appropriate means of connecting into Tilbury Substation itself has been identified as to build new infrastructure within the western half of the site on existing operational land. This avoids the need for additional land take thus reducing potential interaction with other development proposals but requiring the underground cable to be routed amongst existing pylon bases to the north of the substation, between it and the generating station and battery storage just to the north.

5.5 400 kV Permanent Works Summary

5.5.1 In summary the changes and modifications outlined above lead to an aggregated position for the project (excluding the Waveney Valley Alternative) of:

- Total route length approximately 184 km;
- Total overhead line length approximately 159 km;
- Total underground cable length approximately 25 km; and
- Six CSE compounds.

5.5.2 As set out in the preceding text there has been an increase in underground cable length at Raydon with a slight reduction at Fairstead. However, the total length of undergrounding has remained at approximately 25 km as a result of remeasurement and excluding split underground cable corridors. For example, the CSE compound positions and underground cable alignment at Great Horkesley have not changed, however the end-to-end length (encompassing all corridors) has reduced from the previously stated 5.3 km to just under 4 km.

5.5.3 The Waveney Valley Alternative, if taken forward, would change around 2 km of overhead line to underground cable (as currently identified) and result in the following total distances for the elements of the Project listed above:

- Total route length approximately 184 km;
- Total overhead line length approximately 157 km;
- Total underground cable length approximately 27 km; and
- Eight CSE compounds.

6. Temporary Works

6 Temporary Works

6.1 Overall Transport Strategy

6.1.1 The Transport Strategy for the Project will be informed by the requirement for the movement of materials (stone, concrete, steelwork, conductors, and cables etc), equipment and construction personnel. It will also be influenced by the nature and location of existing transport infrastructure (roads suitable for two-way HGV movements and/or Abnormal Indivisible Loads (AIL), ports with appropriate water depth and offloading facilities, available rail paths and offloading facilities etc). Construction programmes may also modify requirements if material can be re-used between sections.

6.1.2 Locally the deliveries and movement to site are expected to be by HGV, LGV and private vehicles. These local deliveries and movements, between the Strategic Road Network and site access points, are the focus of the Project design and assessment with the movement requirements and nature of the road network informing the strategy set out in Section 6.2. The specific siting of different elements facilitating local access has been informed by highway safety, environmental and socio-economic considerations. Avoidance of effects therefore forms an inherent part of the design development approach.

6.1.3 Multi-modal considerations are relevant to the long-distance movement of material from source to the Strategic Road Network and are also influenced by commercial considerations in the context of a potentially global supply chain and to some extent by contractor preference. National Grid are investigating the potential use of existing aggregate handling facilities, including those on the rail network, along with the potential use of aggregate import facilities at ports within the region. These have the potential to provide import locations to meet the needs of the Project. Details will be presented within the Development Consent Order application.

6.2 Construction Haul Road and CSE compound access

6.2.1 The linear nature of the Project and characteristics of the road network within which it is routed present constraints to materials and equipment movement. The Project is crossed by a number of roads suitable for HGV traffic but also by many that are not appropriate for potentially two-way HGV movement. This has led to the conclusion that the most appropriate transport solution is to identify a series of Primary Access Routes (PAR) connecting to the trunk road network connected along the Project corridor by new site access points (bellmouths) leading to off highway haul roads. HGVs would cross unsuitable parts of the highway network at crossover points (with suitable bellmouths) to and from the haul road. LGV and private vehicles would also use these haul road routes but would also be expected to use the wider road network to minimise journey times and distances.

6.2.2 The siting of proposed bellmouths has sought to locate them as close to the proposed works as possible to reduce overall requirements. Siting has also been informed by highway safety considerations (distance from bends, junctions, and visibility splay requirements etc) along with environmental considerations (where possible using or widening existing gates or targeting gaps in boundary vegetation) and socio-economic effects seeking to reduce effects on other existing (or proposed in planning) land use activities.

6.2.3 Similar environmental and socio-economic considerations have also influenced the proposed alignment of the haul road connecting between the bellmouths and work locations. Inherently the haul roads will predominantly follow alongside the proposed alignment, which has sought to avoid areas of woodland, but attention has been paid to minimise effects. In some instances of very high value crops (e.g fruit trees, grape vines) we have sought to follow existing tracks and field boundaries. Some environmentally sensitive locations have been avoided by longer diversions (e.g avoiding bridging the River Waveney and River Stour) and effects on commercial businesses reduced by longer diversions (such as routeing the haul road to the south-east of rather than through Ruffian's Wood) to reduce effects on the business[13] based there.

6.2.4 At CSE compounds it is proposed that part of the temporary access road will be retained and provide the permanent access that is required to these sites.

6.3 EACN substation access

6.3.1 The proposed access arrangements to the EACN substation (which will also be used for overhead line and underground cable construction activities to the east of the railway) have been developed to respond to circumstances where the EACN substation may be built in isolation or in parallel (at least in part) with construction by North Falls and / or Five Estuaries of their substations and underground cable connections. All parties have and continue to engage constructively to develop an appropriate integrated solution. A third customer, Tarchon, has not yet developed its plans sufficiently to understand how it may integrate with these arrangements.

6.3.2 In the case that National Grid constructs first, the proposed access arrangement envisages widening of Bentley Road to be suitable for two-way HGV movement from the junction with the A120 towards Little Bromley (beyond the North Falls and Five Estuaries underground cable corridor) to a new permanent private access road. The new permanent private access road will pass to the southwest of Little Bromley connecting across to Ardleigh Road which would also be widened, and its alignment straightened for two-way HGV flows. This access route would be used for HGV construction traffic (and the much reduced HGV requirement during operational period) and provide the AIL access route through the construction and operational period. Modifications at the Bentley Road / A120 junction would be required to allow AIL vehicle tracking. We are investigating the extent to which additional mitigation may be required for non-motorised users of Bentley Road.

6.3.3 In the event that North Falls and/or Five Estuaries have constructed a haul road between Bentley Road and the EACN substation location alongside their underground cable corridor, either before or during National Grid's construction activities at the EACN substation and east of the railway, then the use of this underground cable corridor haul road route would also be shared by National Grid as the primary HGV construction traffic route. The aforementioned new permanent private access road would still be constructed and used primarily for AIL deliveries and lighter construction traffic vehicles and be utilised for future operations and maintenance HGVs. Use by construction HGVs would more limited and occurring in the event of constraint to use of the underground cable corridor haul road or following its removal and land restoration.

[13] The site offers a variety of uses including secure exercise area, overnight on-site accommodation, swimming ponds etc.

6.4 Temporary Compounds

6.4.1 Temporary construction compounds are required to support the construction of the Project. They will have a variety of uses which may include material loading / unloading; material storage; vehicle parking; siting of welfare facilities; siting of construction cabins / modular offices and to complete construction activity.

6.4.2 A main compound and two satellite compounds are proposed to support the overhead line works between Norwich Main and the EACN substation and another main compound and two satellite compounds for the overhead line works between the EACN substation and Tilbury Substation. A further 24 compounds are proposed to support substation and underground cable installation comprising: at each of the substation sites (Norwich Main, Bramford, EACN, and Tilbury); at each CSE compound location; spaced along the cable to support cable construction works and for activities such as trenchless crossing locations. The scale of construction compound varies with larger sites required where the potential requirement for, for example cable drum storage' is greatest.

6.4.3 Siting of compounds has been informed by the location of particular project elements and the specific need for the compound. For example, a decision to adopt a trenchless crossing technique leads to a need for a construction compound close by. The specific locations proposed for such compounds then seek to avoid / reduce the potential for environmental and socio-economic effects but with a preference to be close to where a bellmouth access to a primary access route is available and preferably close to the primary access route. The latter reduces travel distances for greater efficiency and reduced effects.

6.5 Mitigation

6.5.1 The requirement for some mitigation measures to be incorporated to reduce potential effects of the Project is acknowledged. In addition to necessary works to underground existing lower voltage lines to enable the Project, the preceding Section 5 has identified locations where we are proposing to increase the extent of removal (being replaced by underground cable) of existing 132 kV overhead lattice pylon lines as mitigation to reduce effects. In particular as follows:

- Adopting the existing overhead line alignment near Mellis;
- Extending removal of overhead line between three crossings of an existing line from Offton to Bramford Substation;
- Extending removal of two overhead lines to the south-east of Bramford Substation; and
- Extending removal at a crossing of an existing overhead line near Fuller Street.

6.5.2 Ongoing assessment informed by field surveys and further feedback will inform other measures which will be incorporated into the final project design taken forward to Development Consent Order submission including:

- Further measures in respect of existing or proposed overhead lattice pylon lines (installation as or replacement by underground cable, alternative pylon type etc);
- Planting for ecological and landscape screening / filtering of views for example around the EACN substation and CSE compound sites; and
- Other measures identified through the assessment process.

7. Next Steps

7 Next Steps

7.1 Introduction

7.1.1 The feedback from the 2023 non-statutory consultation together with further technical and environmental work has led to the development of the 2024 preferred draft alignment which is the subject of the 2024 statutory consultation.

7.2 Next Steps

7.2.1 National Grid is undertaking a statutory consultation on its current proposals between 10 April 2024 and 18 June 2024.

7.2.2 During the coming months further detailed assessments and studies will continue along the 2024 preferred draft alignment including environmental and other site-based surveys. These will further inform and refine the location and design of the EACN substation and CSE compounds, pylon positions and adoption of and route of underground cable (particularly at difficult crossings) and the location of areas required temporarily for the construction of the Project.

7.2.3 Feedback from the 2024 statutory consultation will also inform this more detailed work.

7.2.4 The Project continues to be the subject of environmental impact assessments and there will be on-going consultation with stakeholders, interested parties and members of the public.

7.2.5 As with previous stages our decisions will be back checked in the light of feedback to the statutory consultation, the findings of these further studies and assessments and new material information. The outcome will be the design that is submitted to the Planning Inspectorate with the application for a Development Consent Order.

7.2.6 National Grid expects to apply to the Planning Inspectorate for a Development Consent Order in Spring / Summer 2025.

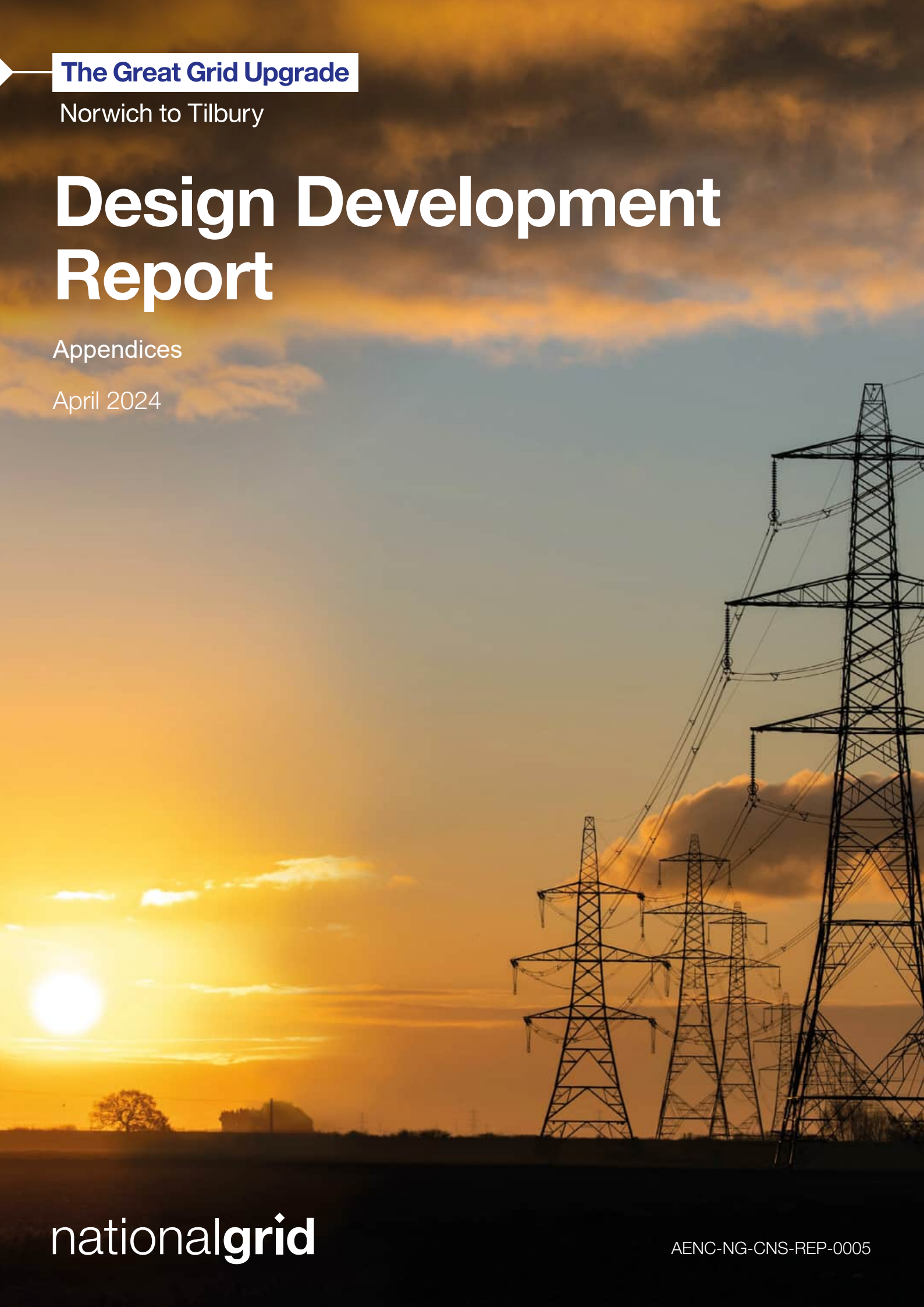
The Great Grid Upgrade

Norwich to Tilbury

Design Development Report

Appendices

April 2024



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Norwich to Tilbury

Design Development Report:

Appendix A – Consideration of National Policy Statements

April 2024

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Abbreviations

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

1 Introduction

1.1 Purpose of this document

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

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

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

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

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

2.1 General guidance

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

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

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

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

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

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

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

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

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

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

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

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

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

The Critical National Priority for Low Carbon Infrastructure

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

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

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

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

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

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

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

Environmental Effects/Considerations

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

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

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

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

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

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

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

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

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

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

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

Health

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

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

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

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

Biodiversity Net Gain

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

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

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

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

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

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

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

Good Design

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

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

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

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

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

Climate Change Adaptation and Resilience

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

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

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

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

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

Network Connection

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

nationally significant low carbon infrastructure is considered as CNP Infrastructure.

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

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

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

Pollution Control and Other Environmental Regulatory Regimes

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

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

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

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

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

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

Safety

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

Common Law Nuisance and Statutory Nuisance

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

Security Considerations

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

2.2 Generic Impacts

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

Air Quality and Emissions

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

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

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

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

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

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

Greenhouse Gas Emissions

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

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

Biodiversity and Geological Conservation

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

Habitats Regulations

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

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

Sites of Special Scientific Interest

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

Regional and Local Sites

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

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

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

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

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

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

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

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

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

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

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

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

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

Civil and Military Aviation and Defence Interests

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

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

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

Flood Risk

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

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

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

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

Historic Environment

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

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

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

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

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

Landscape and Visual

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

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

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

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

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

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

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

scheme'.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Noise and Vibration

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

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

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

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

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

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

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

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

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

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

Socio-Economic Impacts

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

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

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

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

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

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

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

Traffic and Transport

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

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

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

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

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

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

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

Resource and Waste Management

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

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

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

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

Water Quality and Resources

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

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

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

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

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

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

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

Factors influencing site selection and design

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

3.1.3 Paragraph 2.2.2 outlines that siting is determined by:

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

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

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

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

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

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

Climate change adaptation and resilience

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

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

Consideration of Good Design for Energy Infrastructure

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

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

Environmental and Biodiversity Net Gain

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

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

Land Rights and Land Interests

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

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

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

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

Holistic Planning

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

Strategic Network Planning

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

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

Applicants Assessment

Biodiversity and Geological Conservation

Impacts

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

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

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

Mitigation

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

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

Landscape and Visual Impact

Impacts

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

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

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

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

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

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

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

Mitigation

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

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

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

Noise and Vibration

Impacts

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

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

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

Mitigation

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

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

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

Electric and Magnetic Fields (EMF)

Impacts

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

Mitigation

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

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

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

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

Sulphur Hexafluoride

Impacts

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

Mitigation

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

Special Assessment Principles for offshore-onshore transmission

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

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

Applicant Assessment: Consideration of Strategic Network Design

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

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

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

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

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

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

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

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

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

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

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Norwich to Tilbury

Design Development Report:

Appendix B – External Schemes and Studies

April 2024

nationalgrid

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1 External Schemes and Studies

1.1 Purpose of this Appendix

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

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

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

1.2 Offshore Transmission Network Review

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

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

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

1.3 Offshore Coordination Support Scheme

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

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

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

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

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

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

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

1.4.2 The report reviewed:

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

1.4.3 In summary[5] the report concluded that:

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

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

1.4.4 It goes on:

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

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

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

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

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

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

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

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

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

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

1.4.10 A fuller response to the Hiorns Smart Energy Networks Report (titled April 2024 NGET Response to '*East Anglia Transmission Netw[redacted]nt Report by Hiorns Smart Energy Network)'* has been published on the [redacted]

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

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

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

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

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

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

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

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

1.5.3 It went on:

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

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

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

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

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

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Norwich to Tilbury

Design Development Report:

Appendix C – Consideration of Pylon Options

April 2024

nationalgrid

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1 Introduction

1.1 Purpose of this Appendix

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

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

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

1.1.4 Notwithstanding the above this Appendix provides a description of the key features associated with 'traditional' lattice and the T-pylon and considers the different characteristics and potential landscape and visual effects of the alternative pylon types. It also provides commentary as to the locations along the Project where the use of alternatives to traditional lattice pylons may be appropriate in landscape and visual terms, and within those areas, the technical considerations that would arise.

1.2 Context

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

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

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

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

Image 1.1: Typical suspension ‘traditional’ lattice pylon

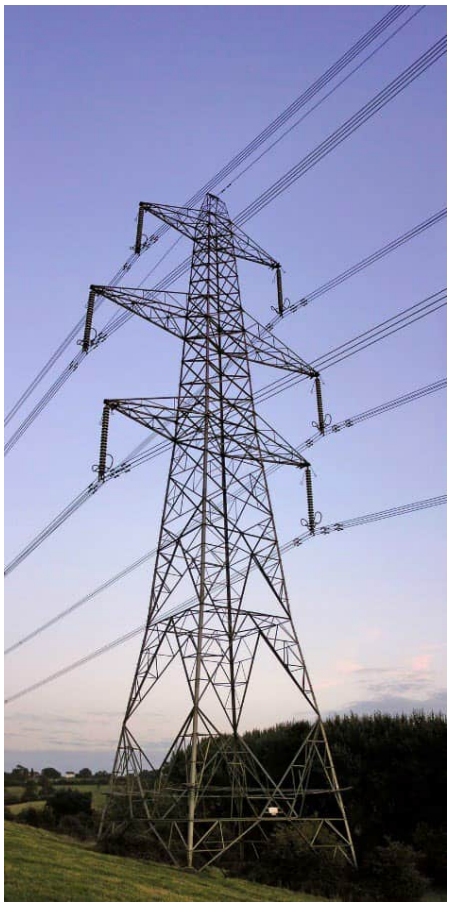


Image 1.2 Typical suspension low height lattice



Image 1.3 Typical suspension T-pylon



2 Comparison of Alternative Pylon Types

2.1 Introduction

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

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

2.2 Design and Operational Characteristics

Design

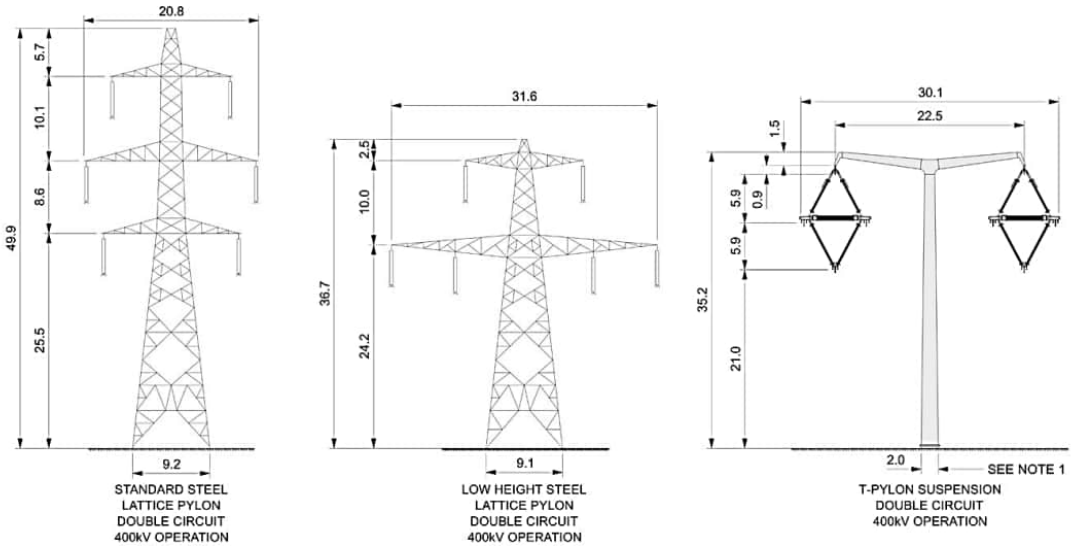
2.2.1 Whilst there are differences between lattice and T-pylon designs, they share a number of technical characteristics. These include:

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

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

2.2.3 Typical arrangements are shown in Figure 2.1

Figure 2.1 Alternative Pylon Types



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

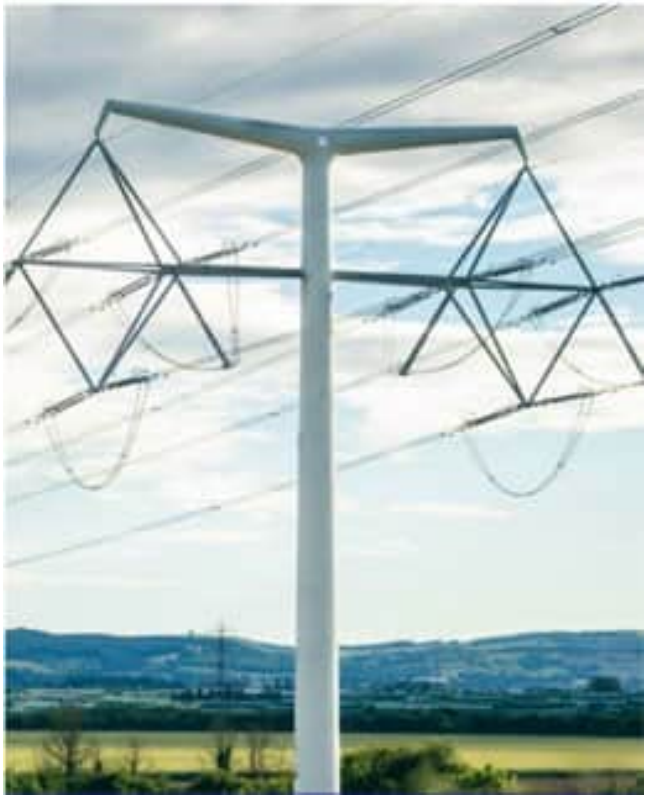
Image 2.1 Typical suspension steel lattice pylon



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

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

Image 2.2 Typical tension T-pylon



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

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

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

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

Construction

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

2.2.12 In summary;

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

Operation and Maintenance

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

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

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

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

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

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

2.3 Landscape and Visual Observations

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

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

3 Consideration of Alternative Pylons for The Project

3.1 Introduction

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

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

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

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

3.2 Landscape and Visual Considerations

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

3.2.2 Locations are described from north to south.

South Norfolk District

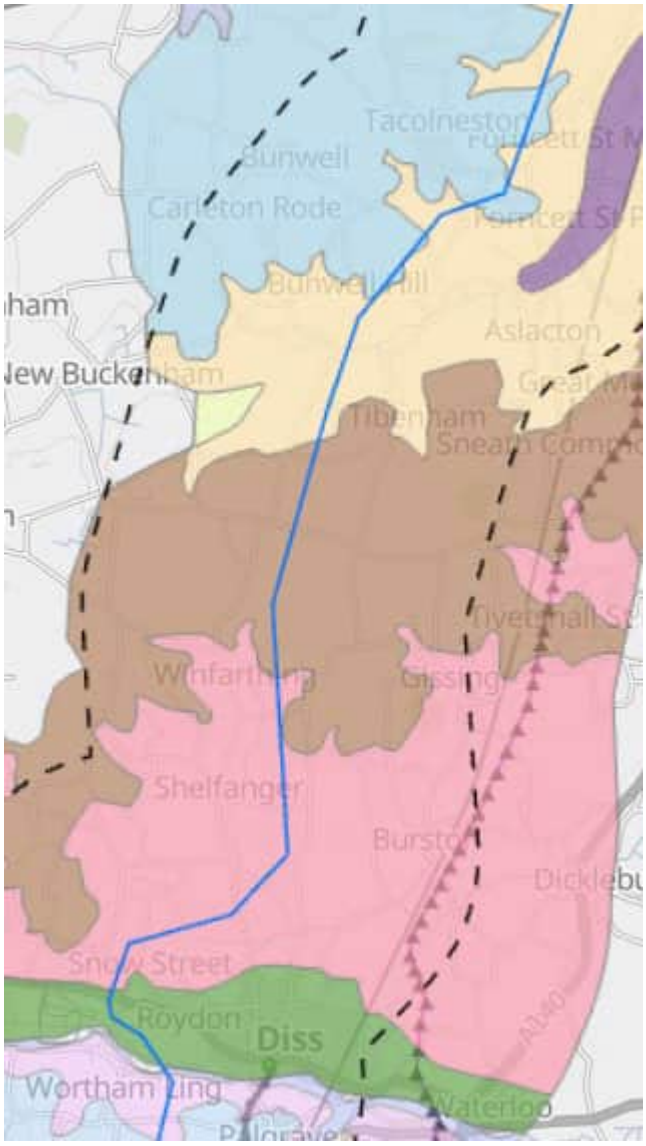
3.2.3 Within South Norfolk District the Project will run between the existing substation (Norwich Main) at Norwich and Diss, on the boundary with Mid Suffolk. The Project will pass through the following landscape character types: Tributary Farmland; Settled Plateau Farmland; Plateau Farmland; and Rural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

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

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

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

Figure 3.1 South Norfolk District



Mid Suffolk District

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

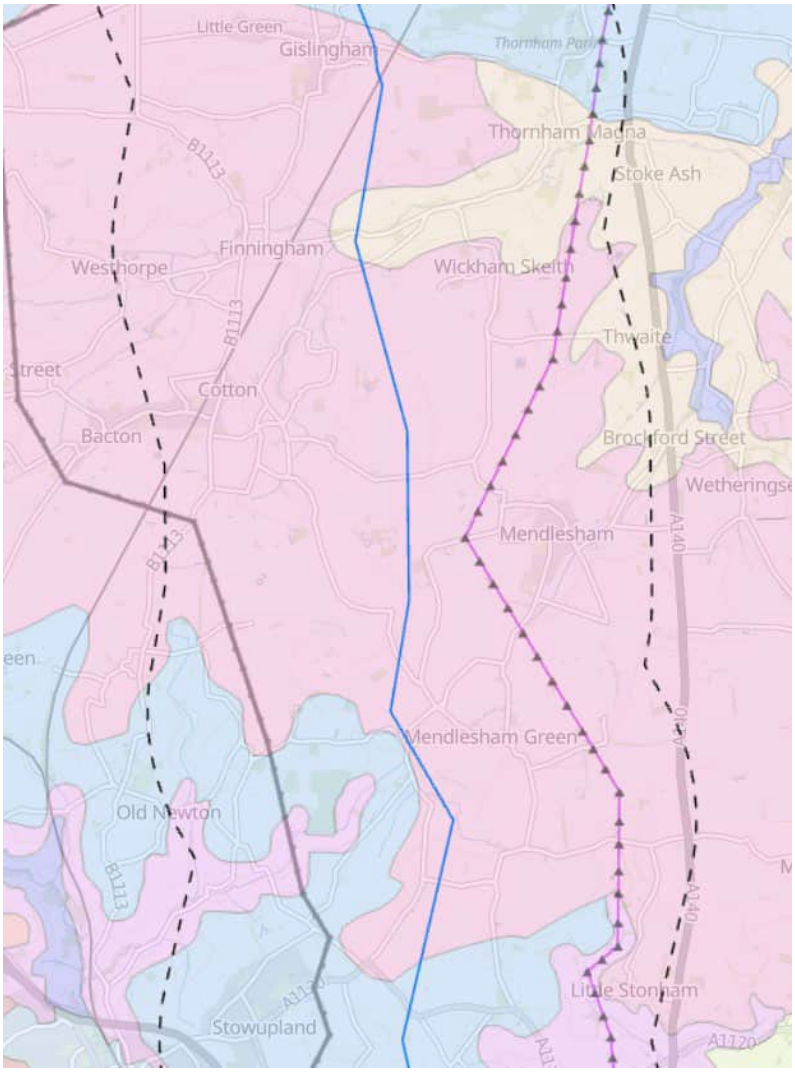
3.2.8 Within Mid Suffolk there may be some cumulative conflicts between T-pylons and existing overhead lines, including:

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

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

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

Figure 3.2 Mid Suffolk District



Babergh District

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

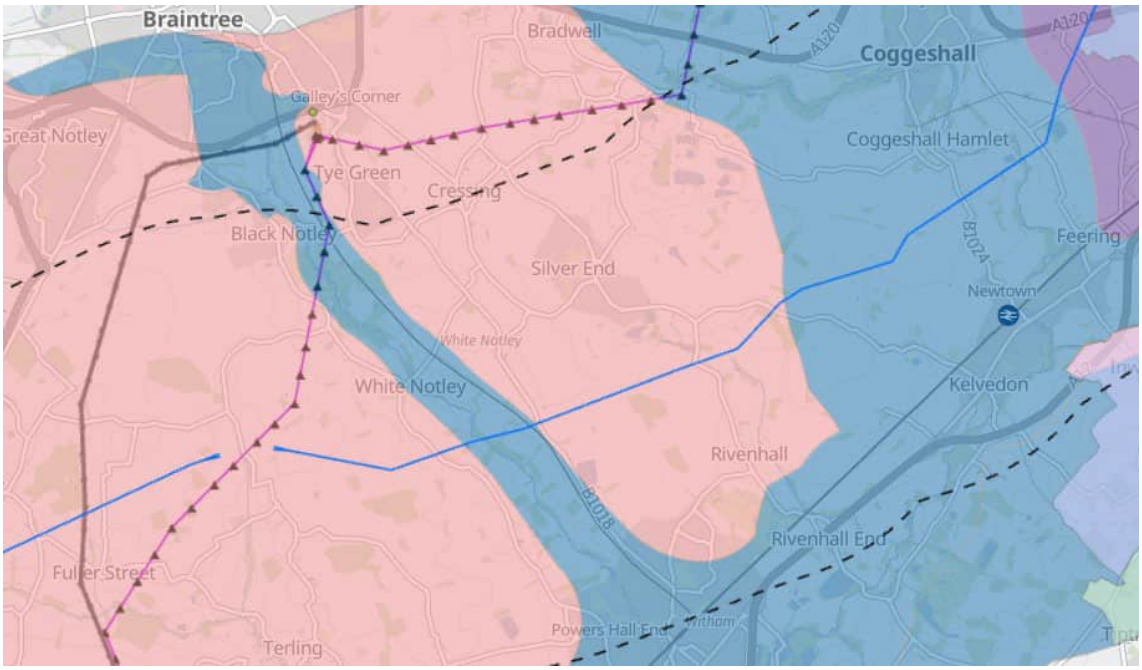
Tendring District / Colchester District

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

Braintree District

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

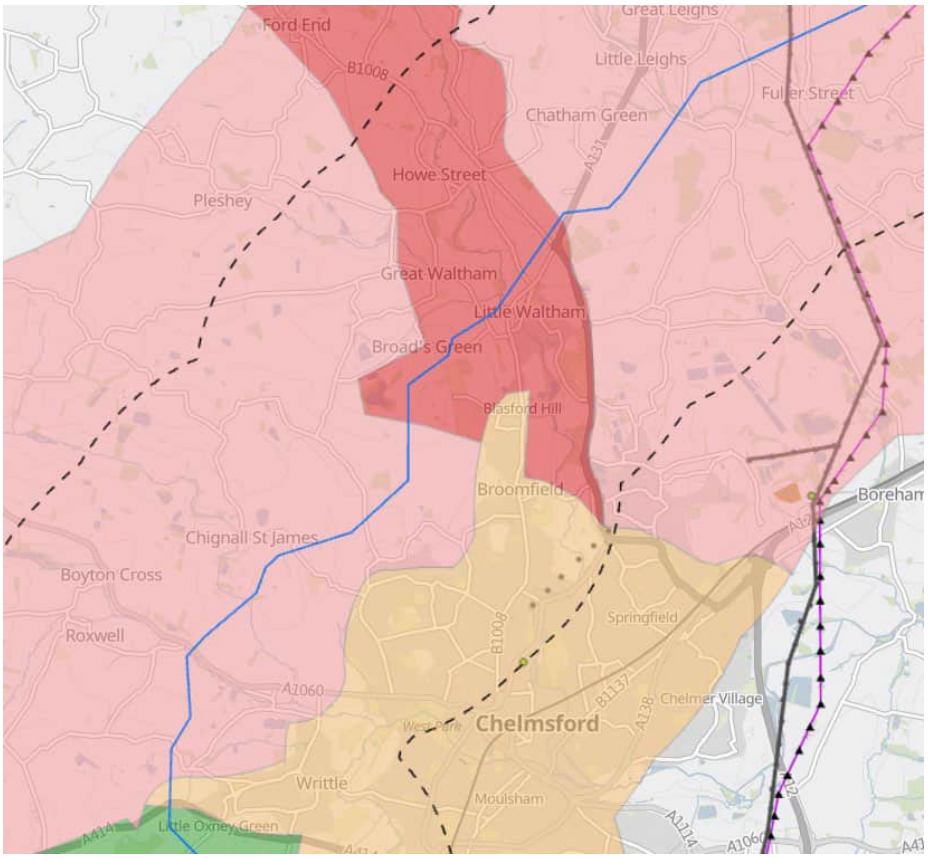
Figure 3.3 Braintree District



Chelmsford City

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

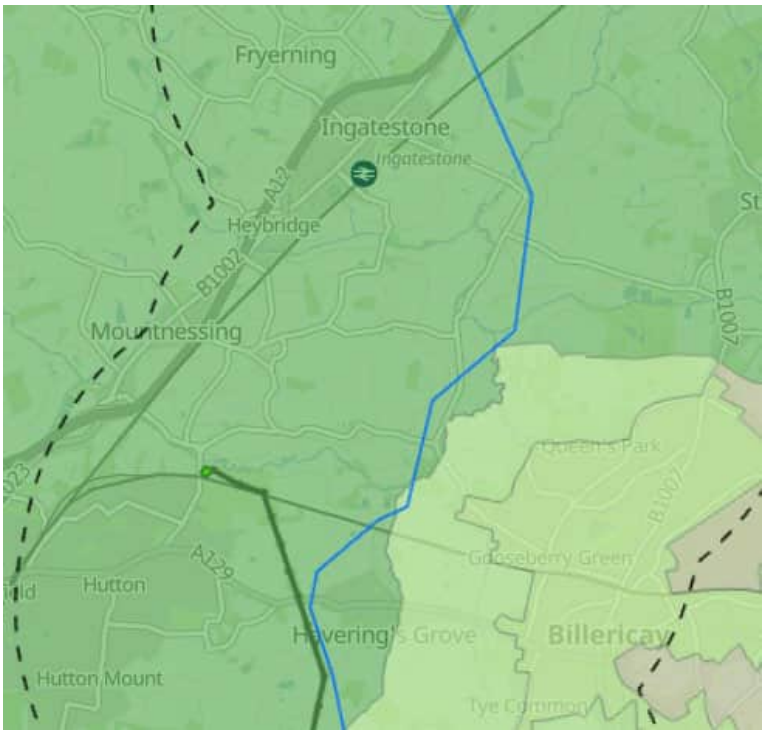
Figure 3.4 Chelmsford City



Brentwood District / Basildon District

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

Figure 3.5 Brentwood District / Basildon District

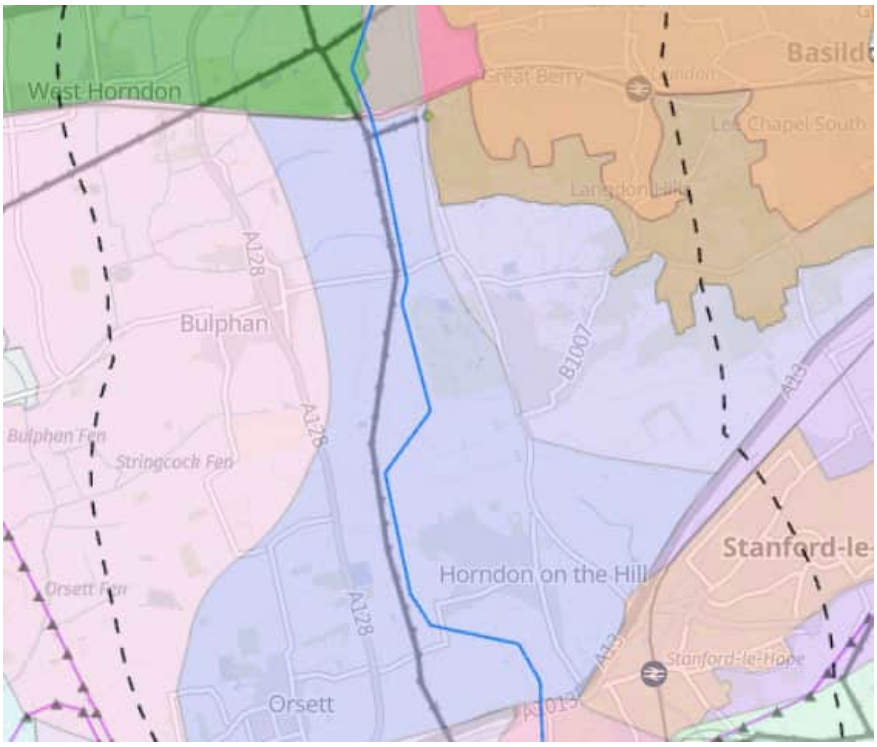


3.2.16 At Havering's Grove the Project will pass through a narrow pinch point before crossing higher ground along the boundary between Brentwood and Basildon. It will pass through the Wooded Farmland, Sloping Farmland and Lowland Settled Claylands character types. South of the A127 the Project will cross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

Thurrock District

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

Figure 3.6 Thurrock



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

3.3 Technical Review

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

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

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

Table 3.1: Summary of indicative technical solutions and technical constraints

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

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

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

4 Consideration of T-pylon as Mitigation

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

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

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

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

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

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

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

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

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

5 Summary and Conclusions

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

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

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

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

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Appendix I25

2024 Strategic Options Back Check

The Great Grid Upgrade

Norwich to Tilbury

Strategic Options Back Check and Review

April 2024



nationalgrid

AENC-NG-CNS-REP-0009

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Executive summary

Purpose of this report

This Strategic Options Backcheck and Review is a technical report providing an overview description of the options that National Grid Electricity Transmission (NGET) has identified and subsequently evaluated for reinforcement of the network in the East Anglia region. This revision has undertaken an update of the latest Needs Case and on the latest generation and network requirements. The backcheck established that the Needs Case is still valid and the options identified continue to resolve the Needs Case as set out. Our cost base remains 2020/21 for evaluation purposes and is therefore unchanged, technology remains unchanged, Environmental and Socio-Economic remains as evaluated previously. Therefore, this backcheck and review has largely remained limited to an update of the needs case.

The stages of NGET's process based approach when transmission system works are identified that would require additional consents and/or permissions are shown below:

Figure 1 – Approach to consenting process



This report forms part of the initial 'Options identification and selection' stage and 'Defined proposal and statutory consultation' stage.

This executive summary provides an overview of the contents of this report and highlights key areas relevant to this project and the consultation on it including:

- reasons why the transmission system in East Anglia needs to change;
- a summary description of options for providing additional transmission system capability that we identified as strategic options;
- how NGET identified and evaluated strategic options, and
- the options that we intend to take forward to the next stage in the process.

National Grid Electricity Transmission

NGET is the owner of the transmission system in England and Wales and holds an electricity transmission licence permitting transmission ownership activities. Our transmission licence requires that we provide an efficient, economic, and co-ordinated transmission system in England and Wales.

NGET, as the regulated provider of electricity transmission services in England and Wales, is regulated by the Office of Gas and Electricity Markets ('Ofgem'). Transmission services include maintaining reliable electricity supplies and offering to construct new transmission system assets for new connections to the National Electricity Transmission System ('NETS').

In accordance with transmission licence requirements, we ensure that the transmission system in England and Wales meets the requirements in respect of transmission system security and quality of service at all times. As part of this requirement, we must ensure that sufficient transmission system capability is provided to meet demand and generator customer requirements and wider transmission system needs that exist and/or are expected.

When planning changes to our transmission system, we must be efficient, co-ordinated and economical and have regard to the desirability of preserving amenity, in line with the duties under sections 9 and 38 of the Electricity Act 1989.

Electricity System Operator (ESO)

The Electricity System Operator (ESO) is a separate legal entity to NGET, but as of 2024 is still part of the National Grid Group. The ESO facilitates several roles on behalf of the electricity industry, including making formal offers to applicants requesting connection to the NETS. The ESO also manages shortfalls in capacity by reducing power flows and constraining generation. This is achieved by paying generators to reduce their outputs, known as 'constraint costs' (i.e. payments). Ultimately, constraint costs are passed on to consumers and businesses through electricity bills.

The ESO also makes investment recommendations to transmission owners, including NGET, through an annual network planning cycle and other periodic reviews. This indicates which areas of the transmission system require reinforcement. This includes:

The Future Energy Scenarios (FES), which take a number of energy industry views as part of a consultation process and develop a set of possible energy growth scenarios;

The Electricity Ten Year Statement (ETYS), which sets out the network performance and requirements for all transmission in Great Britain over the next 10 years; and

The Network Options Assessment (NOA), which takes account of the FES and ETYS and considers options for reinforcing the transmission system, where this is economically optimal in comparison to continuing to pay constraint cost to manage shortfalls in capacity.

The ESO published the Holistic Network Design (HND) report in July 2022, accompanied by a 'NOA Refresh' document. The HND sets out a single integrated transmission network design that supports the large-scale delivery of electricity generated from offshore wind, with the NOA Refresh indicating which options are 'HND critical'.

Ofgem have subsequently published the Accelerated Strategic Transmission Investment (ASTI) decision, which aims to facilitate the achievement of Government targets by streamlining the regulatory approval for the HND critical projects.

The need case

Consistent with the Government's Net Zero target, there has been, and continues to be, growth in the volume of renewable and zero carbon generation that is seeking to connect to the electricity transmission system in the East Anglia and South East regions. UK Government policy clearly sets out the critical requirement for significant reinforcement of the transmission system to facilitate the connection of renewable energy sources and to transport electricity to where it is used. In particular, the British Energy Security Strategy sets targets for the connection of up to 50GW of offshore wind by 2030's as a key part of a strategy for secure, clean and affordable British energy for the long term.

The transmission system in East Anglia was built primarily to serve consumer demand from homes and businesses in the region. For many years the only significant power stations generating in the East Anglia region were the Sizewell A and the Sizewell B nuclear power stations, Spalding North and Sutton Bridge gas fired power stations, and some further smaller 132kV connected gas fired power stations.

This generation capacity has recently been added to by several offshore windfarms with the existing generation totalling 7,687.4 MW of installed capacity. This is expected to grow substantially in coming years. In the East Anglia region, connection agreements have been signed for 22,907.6 MW of new generation (total generation of 30,595 MW minus Existing Generation of 7,687.4 MW). These future connection agreements comprise a large volume of offshore wind generation (including East Anglia Offshore Wind), gas-fired generation, energy storage projects, and a nuclear power station (at Sizewell C).

Peak demand by 2029/30 is anticipated to be approximately 1,767 MW (total for demand substations of Walpole, Norwich Main and Bramford and with only minor demand being consumed at Sizewell). This means that generation in the area will significantly exceed demand.

Without reinforcement, the capacity of the East Anglia and South East existing network is insufficient to accommodate the connection of the proposed new power sources. The ‘Thermal Boundary Export Limit’ – the physical maximum energy capacity the system can accommodate during planned system faults – would be exceeded, preventing export of power to demand centres beyond East Anglia. In these circumstances, generators connecting in the area would be required to reduce their output and would be compensated via a ‘constraint’ payment. These costs would be passed on to end consumers. ESO analysis shows that, in this case, predicted constraint costs are likely to significantly exceed those of reinforcement.

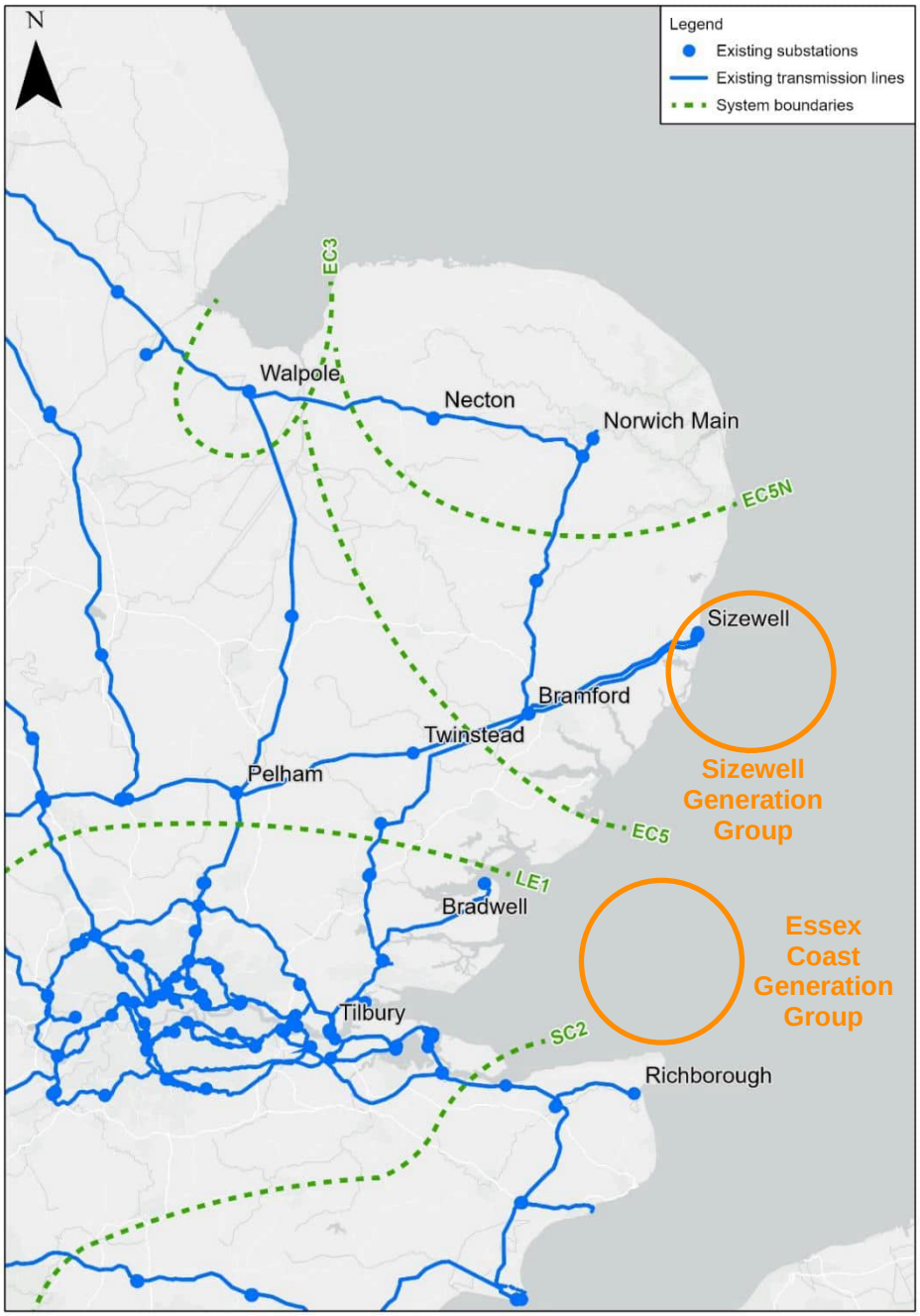
The concept of ‘boundary capacity and capability’ plays an important role in system planning. A boundary notionally splits the system into two parts, crossing critical circuit paths that carry power between the areas where power flow limitations may be encountered. Where ‘boundary capacity’ – the capacity of the circuit(s) across the boundary – is exceeded, we must resolve the capacity shortfall. The standards against which we assess these shortfalls are set out in the NETS System Security and Quality of Supply Standard (SQSS).

Also relevant are ‘generation groups’, which are groups of existing generating stations and / or proposed generating stations connecting in a particular geographical area of the transmission system. These are considered when assessing the network for compliance with the generation connection criteria of the NETS SQSS.

The relevant boundaries in East Anglia and the South East are EC3, EC5N, EC5, LE1 and SC2. The relevant Generation Groups are Sizewell and Essex coast. These are illustrated in the network diagram in Figure 2 below.

All diagrams within the report show the existing system following the completion of the Bramford to Twinstead project, which is included in the background considered for this projects Needs Case. The Bramford to Twinstead project is still subject to its own Development Consent Order which commenced in April 2023. However, should consent be granted, the Bramford to Twinstead project is proposed to be constructed and operational, ahead of the connection of any proposed infrastructure within this report.

Figure 2 – East Anglia and South-East region transmission system and system boundaries



We have assessed the possible impacts associated with the connection of the total volume of new generation on these boundaries. We are required to assess power flows between regions of the transmission system at Average Cold Spell Peak Demand (known as 'Planned Transfers'). Studies show the Planned Transfer required in 2031 would be between 16,126.1 MW and 20,664.2 MW export. This is presented as a range given that the contribution of fossil fuel-based generators will gradually reduce as renewable sources are connected – the top of the range assuming maximum availability of gas turbine generation, and the bottom of the range assumes no contribution from fossil fuelled stations such as gas fired stations. Both the maximum and minimum forecast planned transfers are significant increases on the existing Planned Transfer export condition of 4,573.3 MW and the NETS SQSS requires us to design to the higher of these conditions.

Studies show that there are significant boundary deficits across these boundaries. There are four distinct issues that need to be resolved by system reinforcement:

- Provision of 9,225 MW of capacity across East Anglia EC5 Boundary and 4,931 MW of capacity across EC5N Boundary.
- Provision of 7,476 MW of capacity across the LE1 Boundary.
- Provision of 1,852 MW from the Sizewell Generation Group.
- Provision of 3,480 MW of connection capacity for the Essex Coast Generation Group
- Provision of 1,800 MW of capacity from the SC2 Boundary Group.

In summary, this analysis shows that without reinforcement, the capacity of the East Anglia existing network is insufficient to accommodate the connection of proposed new power sources connecting in the area. This need is emphasised by the analysis of the ESO, which has recommended consecutive 'proceed' signals to new 400 kV circuits in north and south East Anglia in the 2020/21 and 2021/22 Network Options Assessment (NOA) publications. The July 2022 NOA Refresh also identified reinforcements in this area as an HND essential option, meaning that it considers the project as essential to meet the UK Government's 2030 offshore wind targets.

We are therefore required to assess the reinforcement options available for providing the additional capability required.

Initial strategic options analysis

In 2022, as part of the wider Network Planning Process, we carried out an initial assessment of the strategic options available to meet the need case set out above. This drew on the economic analysis of the ESO in the NOA process, and was presented in the April 2022 Corridor and Preliminary Routeing and Siting Study (CPRSS).

This assessment identified 27 combinations of circuit options across a wide geographical area, later reduced to 23 (3 for west, 5 for north and 15 for east). This analysis covered both East Anglia and the South East.

For each of these combinations of options we undertook an appraisal of deliverability, considered the system benefit that the reinforcement provided, considered environmental and socioeconomic factors and considered the cost benefit analysis completed by the ESO.

As part of the annual network planning cycle mentioned above, each combination of options proceeded through a NOA Cost Benefit Analysis (CBA) carried out by the ESO. Through this process the ESO makes investment recommendations to transmission owners (TOs) including NGET as to whether there is an economic case for individual reinforcements to proceed. These recommendations are considered by TOs in their assessment of reinforcement options.

The NOA CBA carried out by the ESO compared the combination of options using a 'Least Worst Regrets' method, being ranked in order of the highest (i.e. worst) regret for each option, in comparison to all other options, across the four FES (i.e. if an option was the best in all FES, its Least Worst Regret would be 0). This analysis concluded that the overall Least Worst Regret option across the four FES was a combination of Norwich – Bramford (AENC), Bramford – Tilbury (ATNC), Richborough – Sizewell (SCD1) and Tilbury – Grain (TENC) as shown in Table 1

Table 1 – NOA Lead Option as Reported in the CPRSS

AENC	Norwich-Bramford	AC OHL (Onshore)
ATNC	Bramford-Tilbury	AC OHL (Onshore)
SCD1	Richborough-Sizewell	HVDC Cable (Offshore)
TENC	Tilbury-Grain	AC OHL (Onshore)

More broadly, this analysis showed that combinations of transmission options to the east and north of the East Anglia region were economically optimal, and that onshore overhead line options would be preferred to offshore HVDC solutions.

The CPRSS concluded, taking all social-economic, environment, technical and cost factors, into account that the preferred solution was a combination of offshore and onshore connections with three distinct elements: an offshore reinforcement between the south coast and East Anglia (SCD1 and referred to as Sea Link); onshore reinforcement between Tilbury and Grain (TENC); and onshore reinforcement between Norwich and Tilbury (AENC/ATNC) via Bramford substation and a new East Anglia Connection Node substation.

AENC, ATNC and SCD1 were given proceed signals in NOA 2021/22, and the July 2022 NOA Refresh also identified these reinforcements as 'HND essential' options, meaning that the ESO considers them to be essential to meet the UK Government's 2030 offshore wind targets. TENC does not have a proceed signal nor is it considered as required currently in the NOA Refresh and is therefore not being taken forward at this time.

The analysis for the NOA and HND provided a solid foundation for identifying strategic options that are most viable and should be taken through further analysis.

Backcheck and review of strategic options

In line with Our Approach to Consenting, this Strategic Options Backcheck and Review is designed to test the assumptions and interim conclusions made to date based on the latest information available.

This report considers solutions to resolve capacity shortfalls across the EC5 North boundary, then across EC5 and LE1 combined – i.e. focusing on the East Anglia area. As noted above, a solution crossing boundary SC2 in the South East, as well as LE1 and EC5, is also necessary to meet the identified requirement to increase the capacity across these boundaries. The optimal technical solution to meet this need – currently SCD1/Sea Link – will be considered separately via the project development work for that project. Given that all potential options crossing SC2 would connect at Sizewell, the combination of onshore and offshore options to meet the remaining East Anglia need are the same regardless of the eventual southern landing point. Due to the interrelation between these projects, we have undertaken an interactivity assessment of Sea Link.

The onshore options to resolve EC5 North boundary requirements are:

- EAN 1 – Necton to Pelham 115km
- EAN 2 – Necton to Twinstead 90km
- EAN 3 – Necton to Bramford 85km
- EAN 4 – Norwich Main to Bramford 80km

For onshore options, four technological solutions are considered: AC Overhead Line; AC Underground cable; AC Gas insulated line (GIL); and HVDC Underground Connection.

The onshore options to resolve EC5 and LE1 boundary requirements are:

- EAS 1 – Twinstead to Tilbury 80km
- EAS 2 – Bramford via New Substation to Tilbury 100km
- EAS 3 – Bramford via a New Substation at Bradwell to Tilbury 130km

One offshore option is also considered:

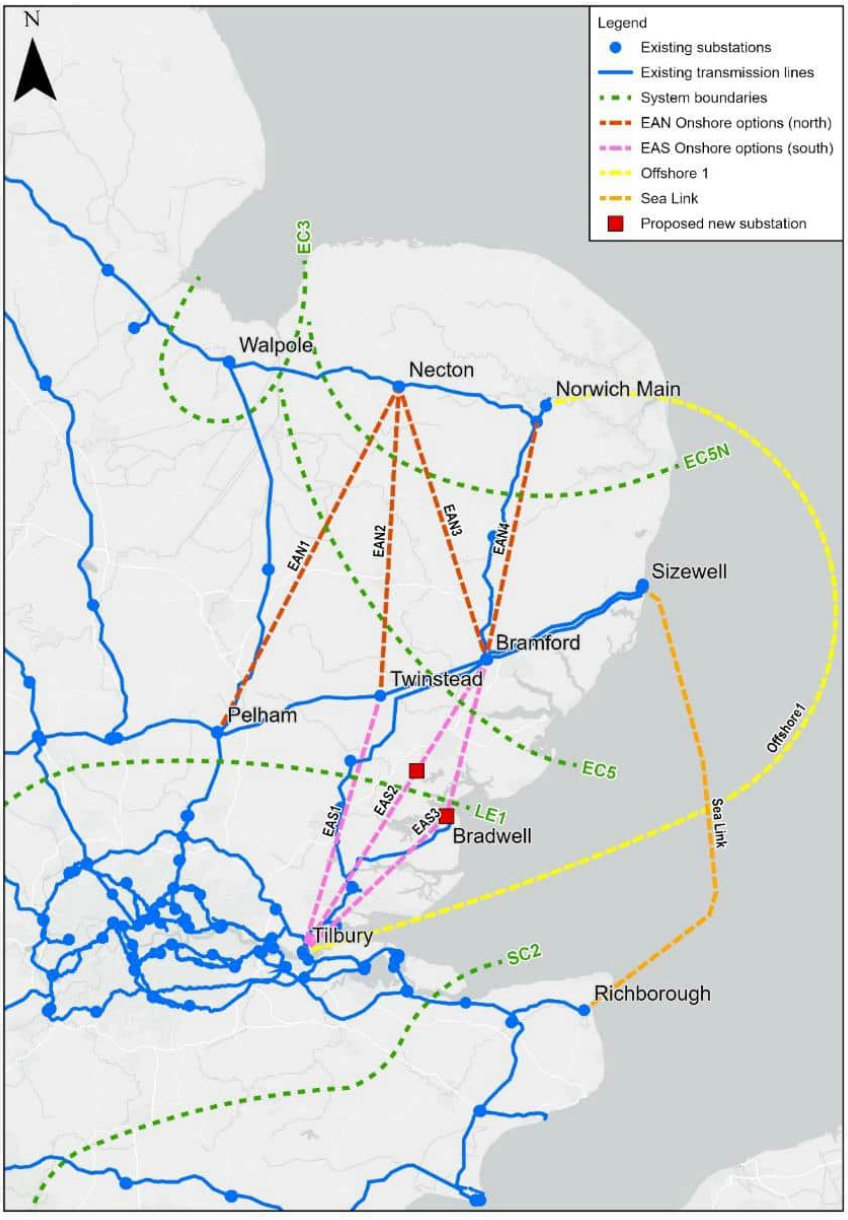
- Offshore 1 – Norwich to Tilbury, crossing boundaries EC5 North, EC5N and LE1

Two technology options are considered for this option: AC Subsea cable and HVDC Subsea cable.

Any combination of one northern (EAN) and one southern (EAS) onshore options can be used to meet the need onshore, whilst Offshore 1 is required to meet the need offshore. SCD1/Sea Link or an equivalent is required in all cases and is therefore not considered a differentiator.

These options are all shown in Figure 3 below.

Figure 3 – Strategic options



An environmental assessment of each alternative has been carried out. This covered the following topics: Landscape and Visual, Historic Environment, Ecology, Physical Environment, Marine Environment (where appropriate), Settlement and Population, Tourism and Recreation, Land Use, Infrastructure and Shipping/Navigation (where appropriate).

Whilst all options would have impacts, none present in-principle environmental issues that could not be mitigated with careful consideration of routeing and use of appropriate technologies to specific constraints, as is consistent with the National Policy Statements (NPSs) against which proposals for nationally significant infrastructure projects are assessed.

Table 2 – Cost Summary of combination of works required to meet project need

Boundary or Group	Onshore Options				Offshore
EC5N & EC3	EAN 1 Necton to Pelham	EAN 2 Necton to Twinstead	EAN 3 Necton to Bramford	EAN 4 Norwich Main to Bramford	
Economic Technology (Capacity)	OHL 115km (6930 MW)	OHL 90km (6930 MW)	OHL 85km (6930 MW)	OHL 80km (6930 MW)	
Capital Cost including non-circuit works	£494.5m	£494.2m	£375.1m	£355.2m	Offshore 1 Norwich Main to Tilbury
Circuit 40yr Lifetime NPV Cost	£787m	£616m	£582m	£548m	
EC5 & LE1	EAS 1 Twinstead to Tilbury	EAS 2 Bramford via new substation to Tilbury	EAS 3 Bramford via Bradwell to Tilbury		
Economic Technology (Capacity)	OHL 80km (6930 MW)	OHL 100km (6930 MW)	OHL 130km (6930 MW)		HVDC 220km (6000 MW) [4000 MW]
Capital Cost including non-circuit works	£454.4m	£539.3m	£658.7m		£4,096.5 [£2,882.4m]
Circuit 40yr Lifetime NPV Cost	£548m	£684m	£890m		£4,661m [£3,232m]
SC2, EC5, LE1 & Sizewell	Sea Link Sizewell area to Richborough area				
Economic Technology (Capacity)	HVDC 145km 2000 MW				
Capital Cost including non-circuit works	£1,420.8m				
Circuit 40yr Lifetime NPV Cost	£1,197m				

For northern onshore options, a principal consideration is the Breckland SPA/ SAC/SSSI complex. Whilst avoidable there is the potential for impacts on the interest features associated with both habitats and species. For the Offshore 1 option, European and national designated

sites are unlikely to be avoidable, in particular at the landfalls at either end. The East Atlantic Flyway (WHS Nomination) if successful is considered to combine existing protections and designations which were considered as part of the CPRSS and do not further influence decision making

A key consideration for southern onshore options is the Dedham Vale AONB, which is in the study area for onshore options EAS 1, EAS 2 and EAS 3. In the case of EAS 1 it should be possible to avoid and/or mitigate effects on the AONB through routeing. In the case of EAS2 and EAS3 the AONB could only be avoided with significantly longer routes. It is therefore likely that these options would require undergrounding in the AONB.

In the case of option Offshore 1 there would be limited opportunity to avoid the Broads National Park and Suffolk Coast and Heaths AONB. However, some opportunities exist for mitigation through more detailed assessment, siting, routeing and construction which would reduce the potential for some visual effects.

The costs of the options are shown in Table 2. As part of the backcheck and review process, costs have reviewed and updated in accordance with the latest costing information. These may therefore, in some cases, supersede previously published costings.

The costs for both onshore and offshore options included within this report have been updated to account for the latest information and are provided in a 2020/2021 price base. For ease of reference, we have also included the customer connection costs within the total. This full backcheck and review of all options supersedes any information provided prior to April 2023.

We have previously provided cost information for comparison between onshore and offshore technologies, most recently to the Offshore Electricity Grid Task Force (OffSET). All previous costs were given for circuits only. This analysis specifically identified that offshore connection costs of at least £500m had not been included in the costs. The cost of options included in this report have been updated to ensure that both the onshore and offshore substations required to make all connections are included within the option cost. This enables the reader to fully understand the comparable option cost, without having to adjust any numbers manually.

The lowest overall onshore cost combination to meet the need is EAN 4 – Norwich Main to Bramford (£355m capital costs/£548m Circuit Lifetime Costs) and EAS 1 – Twinstead to Tilbury (£454m capital costs / £548m Circuit Lifetime Costs). However, EAS 1 is suboptimal in technical terms relative to EAS 2, the next least costly southern option, in several respects.

Firstly, EAS 2 allows the opportunity to construct a new substation in the vicinity of the coast to facilitate connections to North Falls and Five Estuaries wind farms. EAS1 would necessitate a significant amount of further infrastructure and additional costs to connect coastal generation, the Essex Coast Generation Group, further inland (likely to be greater than £500m) significantly in excess of the cost differential between EAS 1 and EAS 2.

Secondly, the proposed new substation in the vicinity of Twinstead Tee is currently included in the Bramford to Twinstead connection project, for which development consent is currently being sought. EAS 1 would require a complete re-design of Twinstead substation, significantly increasing its size and land required and introducing delay to the Bramford to Twinstead scheme, to the significant detriment of consumers in delay costs.

Thirdly, to ensure circuit continuity across EC5 boundary is maintained for a Bramford to Pelham fault, an EAN 4 and EAS 1 combination of options would require the turn-in of the Bramford to Braintree circuits to the new substation. This may require the substation location to be re-considered altogether with additional cost and complexity to this proposal.

Therefore, taking into account environmental, socio-economic, net zero government obligations, technical and cost perspectives, the optimal overall onshore combination to meet the need and facilitate the connection of North Falls and Five Estuaries is:

- EAN 4 - Norwich Main to Bramford with capital costs of £355m and Circuit Lifetime Costs of £548m; and
- EAS 2 – Bramford via a new coastal substation to Tilbury with capital costs £539.3m and Circuit Lifetime Costs of £684m.

The total capital cost would therefore be £894m, with Circuit Lifetime Costs of £1,232m.

Although it would be challenging to avoid altogether impacts on the Dedham Vale AONB as a result of EAS 2, this is not considered to be inconsistent with the relevant policies in National Policy Statements EN-1 (2024) and EN-5 (2024). If routeing to avoid the AONB is not considered viable, it would be possible to use underground cables.

Originally, the lowest cost offshore alternative option to meet the need was option Offshore 1 (Norwich Main to Tilbury) at 4000 MW with capital costs £2,882.2m and Circuit Lifetime Costs of £3,232m, in combination with SCD1/Sea Link or an alternative. However, this option no longer provides the required capacity of a minimum of 8,000 MW across LE1 and EC5, since the updated contracted generation described in the needs case section of this report has increased. This option has been included in this report as it was considered when earlier contracted positions allowed however this is no longer the case against existing contracted backgrounds. Option Offshore 1 is also suboptimal in technical terms relative to the optimal onshore combination of options (EAN 4 and EAN 2).

The offshore alternative to match the capacity of AC onshore options is a Norwich Main to Tilbury 6000 MW option, which, when combined with Sea Link, would meet the requirements of delivering 8,000 MW across EC5 and LE1 by 2050. The capital costs would be £4,097m and Circuit Lifetime Costs £4,661m, significantly in excess of the costs of onshore combinations. Option Offshore 1 is also suboptimal in technical terms relative to the optimal onshore combination of options (EAN 4 and EAN 2).

Firstly, the 6,000 MW Offshore 1 option would only facilitate the contracted Essex Cost Generation Group including Tarchon Interconnector, North Falls and Five Estuary offshore wind generation, with an offshore connection into the link. This would require significant additional infrastructure. The offshore HVDC platform and offshore AC platform needed to accommodate the required HVDC converter station and AC substation, would have additional capital costs of greater than £500m.

Secondly, option Offshore 1 would not provide the flexibility of onshore connection options which facilitate flows both to the West and East of the transmission system for different system faults. Offshore 1 only provides flows to the East of London, whereas energy demand is distributed throughout England so this option would not be as effective for all system conditions compared with the combination of an EAN and EAS option.

To achieve a fully like-for-like alternative with the AC North and South of East Anglia circuit options, with the additional flexibility of connecting into Bramford or substations to the west, the HVDC solution would need to be of a multi-terminal design, with 3 additional 2000 MW converters located at Bramford and cabling 50km from a DC bussing point offshore. This would significantly increase the costs and the potential environmental effects.

As noted above, whilst all potentially viable options would have potential environmental and socio-economic impacts, none present in-principle issues that could not be mitigated with careful consideration of routeing and use of appropriate technologies to specific constraints.

Taking all of this into account, we propose at the current stage to take forward an interim preference of the onshore combination of **EAN 4 OHL Norwich Main to Bramford** and **EAS 2 OHL Bramford via a new substation to Tilbury**, alongside SCD1/Sea Link or an alternative connection from Sizewell area to north Kent.

This would meet the urgent and critical need to increase capacity across boundaries EC3, EC5N, EC5, LE1 and SC2, as well as providing the required capacity for the Sizewell and Essex Coast Generation Groups. We will continue to review our work including in light of changes in circumstances and we will have regard to consultation responses.

The project was formerly known as East Anglia Green Energy Enablement (GREEN). We've changed the name to Norwich to Tilbury make it clear that this project is part of The Great Grid Upgrade, the largest overhaul of the grid in generations.

1. Introduction

1.1.1 This version of the Strategic Options Backcheck Review report, post non statutory consultation, has been prepared by National Grid Electricity Transmission plc (NGET) as part of the ongoing strategic options assessment and decision-making process involved in promoting new transmission projects. It records how we have had regard to a range of considerations in developing those projects. This report has been prepared in accordance with 'Our Approach to Consenting'[1].

1.1.2 This report addresses the Norwich to Tilbury project in East Anglia, but also includes information about wider reinforcements in the South East, which are interactive with the need case. The project is described in greater detail later in this report. This consideration of strategic options is part of an iterative process in response to interaction of a range of emerging energy projects and customer requirements.

1.1.3 As we continue to develop our plans and as our proposals evolve, we keep strategic options under review, taking account of consultation feedback and any changes that might influence the assessment of technical, environmental, socio-economic and cost considerations.

1.1.4 As set out in Our Approach to Consenting there are 5 stages. This document forms part of the "Options identification and selection stage" and is at the very start of the process, as shown below. This report provides information about scheme development, to support statutory consultation.

Figure 1.1 – Approach to consenting process



1.1.5 The report is structured as follows:

- Background to England and Wales electricity transmission system (Section 2)
- Summary of the need case (Section 3)
- Identification of strategic options (Section 4)
- Options assessment process (Section 5)
- Strategic options overview (Section 6)
- Appraisal of strategic options (Sections 7 to 15)
- Interaction with other projects (Section 16)
- Conclusions (Section 17)

[1] Our Approach to Consenting, National Grid (April 2022) https://www.nationalgrid.com/electricity-transmission/document/142336/download

1.1.6 This document is also supported by a detailed set of appendices setting out our obligations, technology assumptions and cost appraisal methodology as follows:

- Appendix A Summary of National Grid Electricity Transmission Legal Obligations
- Appendix B Requirement for Development Consent Order
- Appendix C Technology Overview
- Appendix D Economic Appraisal
- Appendix E Mathematical Principles used for AC Loss Calculation
- Appendix F Glossary of Terms and Acronyms
- Appendix G Appraisal study areas

1.1.7 This Strategic Options Backcheck and Review is part of an iterative process, investigating prospective opportunities and reassessing previous provisional conclusions. The conclusions of this report will, in due course, be supplemented by feedback from consultation exercises, along with other elements such as design evolution. Consistent with Our Approach to Consenting, we will continue to assess relevant technical, environmental, socio-economic and cost factors as part of ongoing appraisals.

2. Background to England and Wales electricity transmission system

2.1 Background

2.1.1 In 2019 the Committee on Climate Change (CCC) published its Net Zero report setting out recommendations to the UK Government on long-term emissions targets for the UK. The Government subsequently adopted the Climate Change Act 2008 (2050 Target Amendment) Order 2019, which increased its pledge to achieve 100% reduction in emissions by 2050. One of the ways this will be achieved is through decarbonisation, including moving away from fossil fuels providing energy to our homes and businesses. The vision for a transition to clean energy was set out in December 2020 with the publication of the Energy White Paper, which added further detail to the Prime Minister's Ten Point Plan for a Green Industrial Revolution. This requires the adoption of alternative sources of energy to power our homes, transport and businesses.

2.1.2 As a result, electricity production is now moving towards reducing greenhouse gas emissions, by increasing renewable and low carbon sources, such as offshore and onshore wind, solar energy and new nuclear generation. The National Infrastructure Commission (NIC) has published a report recommending to the UK Government that renewable generation can be increased to 65% of supply by 2030 at no adverse cost to consumers, enabling the decarbonisation in part of sectors such as transport and heating via electrification.

2.1.3 Following the publication of the NIC report, the UK Government published the British Energy Security Strategy5 in April 2022 setting out a strategy for secure, clean and affordable British energy for the long term. This strategy sets out energy ambition across a number of sectors such as, including:

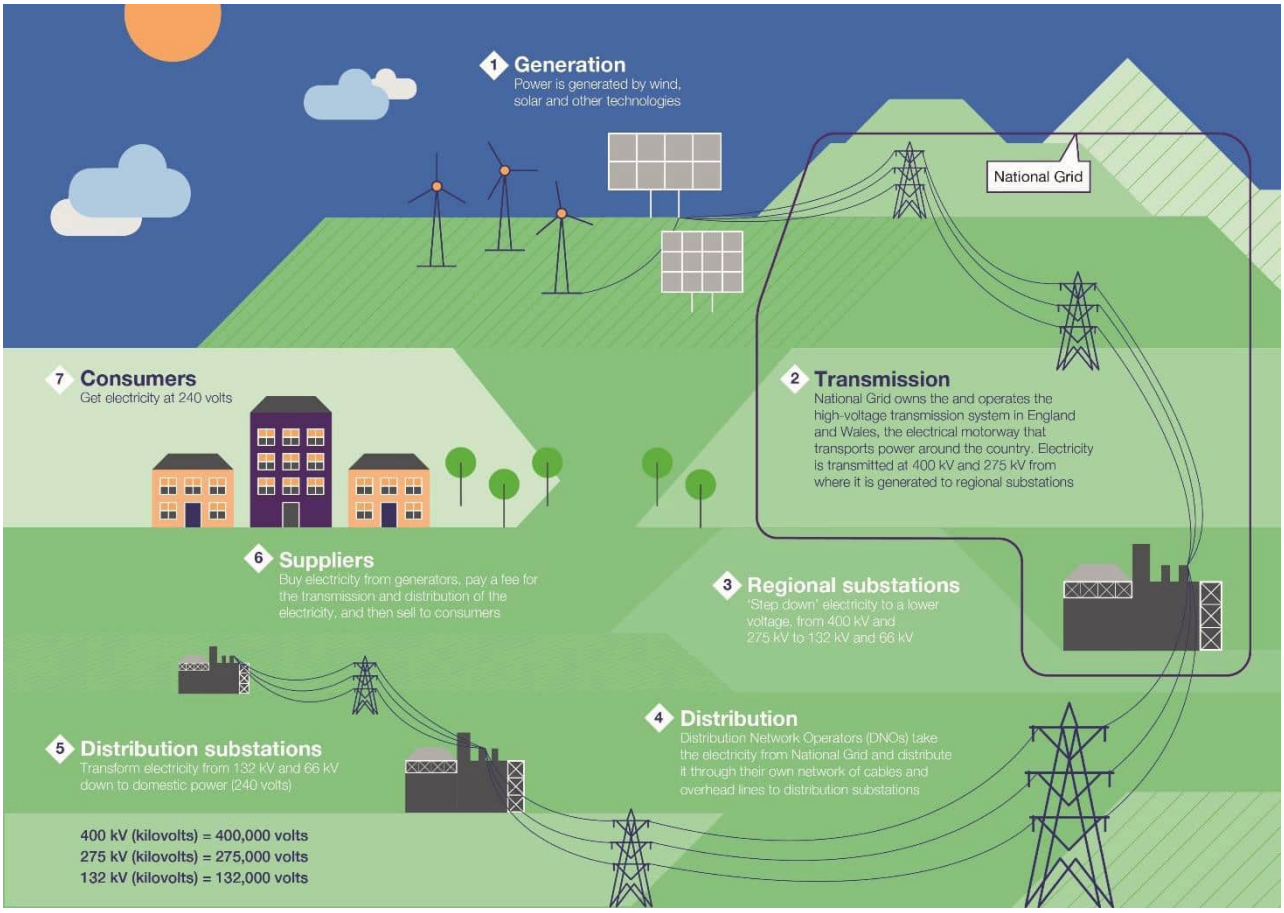
- Up to 8 Reactors of Nuclear energy being progressed reaching up to 24GW to be achieved by 2050;
- Up to 50GW of offshore wind connected by 2030 including 5GW of which will be offshore floating wind;
- Up to 10GW of low carbon hydrogen production capacity by 2030, doubling the previous ambition; and
- 600,000 heat pump installations a year by 2028 and improving housing stock insulation.

2.1.4 The Powering Up Britain paper was published in March 2023 by the UK Government. This document provides an update of the strategy for secure, clean and affordable British energy for the long term future, and closely relates to the points raised in Section 3.

2.1.5 To facilitate these ambitions, electricity network infrastructure is needed to ensure that energy can be transported from where it is generated to where it is used.

2.1.6 The existing transmission system operates at 400 kV and 275 kV and transports bulk supplies of electricity from generating stations to demand centres. Distribution systems operate at 132 kV and below in England and Wales and are mainly used to transport electricity from bulk infeed points (interface points with the transmission system) to the majority of end customers. See Figure 2.1 below.

Figure 2.1 – The electricity system from generator to consumer



2.1.7 A single electricity market serves the whole of Great Britain. In this competitive wholesale market, generators and suppliers trade electricity on a half hourly basis. Generators produce electricity from a variety of energy sources, including coal, gas, nuclear and wind, and sell energy produced in the wholesale market. Suppliers purchase electricity in the wholesale market and supply to end customers.

2.1.8 Electricity can also be traded on the single market in Great Britain by generators and suppliers in other European countries. Interconnectors with transmission systems in France, Northern Ireland, Belgium, Denmark and the Netherlands are used to import electricity to and/or export electricity from the transmission system.

2.2 National Grid's role

2.2.1 National Grid Electricity Transmission plc (NGET) is the owner of the high voltage transmission system in England and Wales and is part of the National Grid Group of companies.

2.2.2 Transmission of electricity in Great Britain requires permission by a licence granted under Section 6(1)(b) of the Electricity Act 19896 (as amended) (the Electricity Act). NGET has been granted a transmission licence (the Transmission Licence) and is

therefore bound by legal obligations, which are primarily set out in the Electricity Act and the Transmission Licence. In its role in providing transmission services in England and Wales, NGET is regulated by the Office of Gas and Electricity Markets ('Ofgem').

2.2.3 NGET's legal obligations include duties under section 9, section 38 and Schedule 9 of the Electricity Act. In summary, these require us to:

- Develop and maintain an efficient, co-ordinated and economical system of electricity transmission;
- When formulating proposals for the installation of electric line or the execution of any other works for or in connection with the transmission or supply of electricity, 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
- When formulating such proposals, 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.

2.2.4 The Electricity System Operator (ESO) is a separate legal entity to NGET, but as of publication is still part of the National Grid Group. The ESO facilitates several roles on behalf of the electricity industry, including making formal offers to connection applicants to the National Electricity Transmission System (NETS).

2.2.5 NGET is obligated to provide the physical connections to the elements of the NETS that NGET own.

2.3 National Grid's existing transmission system

2.3.1 The electricity transmission system is a means of transmitting electricity around the country from where it is generated to where it is needed. The existing transmission system was developed to transport electricity in bulk from power stations to demand centres. Much of the transmission system was originally constructed in the 1960s. Incremental changes to the transmission system have subsequently been made to meet increasing customer demand and to connect new power stations and interconnectors with other transmission systems.

2.3.2 ofNGET's transmission system consists of approximately 7,200 km of overhead lines and a further 700 km of underground cabling, operating at 400 kV and 275 kV. In general, 400 kV circuits have a higher power carrying capability than 275 kV circuits. These overhead line and underground cable circuits connect around 340 substations forming a highly interconnected transmission system. Further details of the transmission system including geographic and schematic representations are published by the ESO annually as part of its Electricity Ten Year Statement (ETYS)[2].

2.3.3 The transmission system provides a connection between large generation stations and the connection of demand for homes and businesses in England and Wales. The generation directly connected to the electricity transmission system tends to be of two types: low carbon energy (nuclear, wind farms, solar) and large thermal generation (gas powered generation and older fossil fuel powered generation). This is also supplemented by new storage technologies such as battery storage and hydro storage.

[2] Electricity Ten Year Statement, National Grid ESO (2022) https://www.nationalgrideso.com/document/275611/download

2.3.4 Circuits are those parts of the system used to connect between substations on the transmission system. The system is mostly composed of double-circuits (in the case of overhead lines carried on two sides of a single pylon) and single-circuits. Substations provide points of connection to the transmission system for power stations, distribution networks, transmission connected demand customers (e.g. large industrial customers) and interconnectors.

2.4 How the transmission system operates

2.4.1 A generation group consists of a number of existing generating stations and / or proposed generating stations connecting in a particular geographical area of the transmission system.

2.4.2 Proposed generating stations require a connection agreement with the ESO to authorise their connection to the transmission system. The relevant transmission owner must then assess the generation group to ensure that the transmission system is sufficient in the area to accommodate the existing and proposed generation. Upon completion of the assessment, the ESO will make a formal offer of connection.

2.4.3 The capacity of the transmission system is based on the physical ability of electrical circuits to carry power. Each circuit has a defined capacity and the total capacity of the circuits in a region or across a boundary is the sum of all of the capacity of all the circuits.

2.4.4 The capability of the transmission system is the natural flow of energy that can occur in the infrastructure comprising the network. Due to the physical properties of the transmission system, this is often not as great as the theoretical capacity of the infrastructure in question.

2.4.5 Where power flows are constrained by the transmission system across a specific number of circuits, this is termed a "boundary" by the ESO. Such boundaries are used in the ETYS to identify constraints which may require changes to the transmission system in the next 10 years.

2.4.6 Where capacity and capability of the transmission system are not sufficient, either from a generation group or across a boundary, National Grid will be required to reinforce the network. It does this by either modifying the existing network (if possible) and / or constructing additional transmission infrastructure to resolve the shortfall.

2.5 Requirement for changes to the transmission system

2.5.1 Under section 9 of the Electricity Act 1989, NGET is required to provide an efficient, co-ordinated, and economical transmission system in England and Wales. The transmission infrastructure needs to be capable of maintaining a minimum level of security of supply and of transporting electricity from and to customers. NGET is required to ensure that its transmission system remains capable as customer requirements change.

2.5.2 The transmission system needs to cater for demand, generation and interconnector changes. Customers can apply to the independent ESO for new or modified connections to the transmission system. The ESO is required to respond to each customer application with an offer for a new or modified connection.

2.5.3 In line with the Government's 2050 targets, a large number of applications have been made to the ESO for connection at locations that are more remote from the existing transmission system, or which are in the vicinity of parts of the transmission system that do not have sufficient capacity available for the new connection.

2.5.4 NGET has a key role providing a transmission system which serves all consumers in England and Wales. As a monopoly, we are regulated by the Office of Gas and Electricity Markets (Ofgem) on behalf of consumers and is required to operate in accordance with the Transmission Licence. This includes maintaining reliable electricity supplies and offering to connect new energy suppliers. Where the network needs to be developed to do that, we must be efficient, co-ordinated and economical and have regard to the desirability of preserving amenity, in line with the duties under sections 9 and 38 of the Electricity Act.

2.5.5 In developing new network infrastructure proposals, we are therefore guided by the legislative and policy framework set by the UK Government. Including requirements set out in the Planning Act 2008 and associated National Policy Statements as described in detail in Appendix B.

2.6 Electricity System Operator (ESO) role in development of the transmission system

2.6.1 The ESO has annual processes to publish the Electricity Ten Year Statement (ETYS), which sets out the network performance and requirements for all transmission in Great Britain over the next 10 years.

2.6.2 The ESO also has annual processes to publish the **Future Energy Scenarios**[3] (FES) which take a number of energy industry views as part of a consultation process and develop a set of possible energy growth scenarios.

2.6.3 Similarly, it has an annual process to publish the **Network Options Assessment**[4] (NOA), which considers options for reinforcing the transmission system and makes economic recommendations. This document takes account of the ETYS and FES to establish via a Cost Benefit Analysis (CBA) process when it is right to take forward options proposed by transmission owners to increase network capacity. This considers the capital costs of the proposal, delivery timescales and constraint costs (as explained further below) avoided by delivering the proposal. This establishes when a proposed reinforcement becomes the most economical, efficient, and coordinated way to deliver value to Great Britain's energy consumers.

2.6.4 The ESO manages shortfalls in boundary capacity by reducing power flows and constraining generation. This is achieved by paying generators to reduce their outputs, known as 'constraint costs'. Ultimately, constraint costs are passed on to consumers and businesses through electricity bills.

2.6.5 The ESO published the **Holistic Network Design**[5] **(**HND) report in summer 2022. It is now engaged in the HND Follow Up Exercise. The HND sets out a single integrated

[3] Future Energy Scenarios, National Grid ESO (2022) https://www.nationalgrideso.com/future-energy/future-energy-scenarios

[4] Network Options Assessment 2021/22 Refresh, National Grid ESO (2022) https://www.nationalgrideso.com/document/262981/download

[5] A Holistic Network Design for Offshore Wind, National Grid ESO https://www.nationalgrideso.com/future-energy/beyond-2030/holistic-network-design-offshore-wind

transmission network design that supports the large-scale delivery of electricity generated from offshore wind.

2.6.6 The ESO is also undertaking the **Offshore Co-ordination Project**, of which the HND is part. This considers how the transmission network is designed and delivered, to ensure that the transmission connections for offshore wind generation are delivered in the most appropriate way considering the increased ambition for offshore wind to achieve net zero. It considers environmental, social and economic costs.

2.6.7 Subsequent to the ESO reinforcements identified in HND and NOA refresh, Ofgem have published the **Accelerated Strategic Transmission Investment** (ASTI) decision, which aims to facilitate achieving government targets by streamlining the regulatory approval and funding process for ASTI projects. Norwich to Tilbury is an ASTI project.

2.7 National Statutory Duties (Electricity Act 1989)

2.7.1 NGET has duties placed upon it by the Electricity Act 1989 ('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. In the instances that NGET is developing new infrastructure, it is required to have regard to these following statutory duties under the Electricity Act:

- Electricity Act 1989 – Schedule 9 (preservation of amenity including: taking into account impacts upon communities. Landscape, visual amenity, cultural heritage and ecological resources).
- Section 38 and Schedule 9 of the Electricity Act 1989 state that: “(1) In formulating any relevant proposals, a licence holder or a person authorised by exemption to generate, distribute, supply or participate in the transmission of electricity:
  - shall 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 he 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.”

2.8 National Policy Statements (NPSs)

2.8.1 National Policy Statements are produced by government and set out the UK Government’s objectives for the development of nationally significant infrastructure. The National Policy Statements relevant to energy network infrastructure are EN-1 Overarching National Policy Statement for Energy, EN-3 National Policy Statement for Renewable Energy, and EN-5 National Policy Statement for Electricity Networks Infrastructure. T. The NPSs were designated in January 2024.

2.8.2 Taken together they provide the primary basis for decisions on applications for electricity networks infrastructure which are classified as Nationally Significant Infrastructure Projects. Where relevant (e.g. in the case of the consideration of development in nationally designated landscapes) these are referred to in this Strategic Options Backcheck and Review. An overview of main themes relevant to this backcheck

and review is provided below with more detailed commentary within Appendix A to the Design Development Report published as part of the 2024 Statutory Consultation.

2.8.3 The Overarching NPS for Energy (NPS EN-1) sets out the Government's overarching policy about the development of NSIPs in the energy sector. It sets out the goal of decarbonising the energy network to achieve net zero whilst ensuring security of supply. It sets out how as the electricity system grows in scale, dispersion, variety, and complexity, work would be needed to protect against the risk of large-scale supply interruptions in the absence of sufficiently robust electricity networks. While existing transmission and distribution networks must adapt and evolve to cope with this reality, development of new transmission lines of 132 kV and above would be necessary to preserve and guarantee the robust and reliable operation of the whole electricity system. EN-1 recognises that to 'produce the energy required for the UK and ensure it can be transported to where it is needed, a significant amount of infrastructure is needed at both local and national scale. It refers to how the onshore transmission network would require substantial reinforcement in East Anglia to handle increased power flows from offshore wind generation (paragraph 3.3.68).

2.8.4 NPS EN-1 Section 4.2 sets out the Government's commitments to prioritise for low carbon infrastructure. Paragraph 4.2.1 states that "Government has committed to fully decarbonise the power systems by 2035, subject to security of supply, to underpin its 2050 net zero ambitions." Paragraph 4.2.4 states that the "Government has therefore concluded that there is a critical national priority (CNP) for the provision of nationally significant low carbon infrastructure." Paragraph 4.2.5 lists the types of infrastructure which are nationally significant low carbon infrastructure for the purposes of the CNP policy and this includes electricity grid infrastructure in the scope of EN-5, including network reinforcement, upgrade works and associated infrastructure such as substations.

2.8.5 NPS EN-3 for Renewable Energy Infrastructure, also includes support for the onshore infrastructure required to deliver new offshore wind developments. Paragraphs 2.8.34 to 2.8.43 (inclusive) reiterate the position set out in EN-1 and EN-5 that a co-ordinated approach to onshore-offshore transmission is required. The NPS also includes references to CNP Infrastructure and the application of the assessment principles outlined in Section 4 of EN-1. Applicants must show how any likely significant negative effects would be avoided, reduced, mitigated or compensated for, following the mitigation hierarchy.

2.8.6 NPS EN-5 (National Policy Statement for Electricity Networks Infrastructure) in conjunction with NPS EN-1 sets the policy context and provides the main guidance for the development and assessment of new network infrastructure. It outlines the Government's view that the development of overhead lines is not incompatible in principle with an applicants' statutory duty under Schedule 9 to the Electricity Act 1989 to have regard to visual and landscape amenity and to reasonably mitigate possible impacts. It sets out the government's position that overhead lines should be the strong starting presumption for electricity networks developments and that The Holford Rules (guidelines for the routing of new overhead lines) and the equivalent Horlock Rules for substation infrastructure, should be embodied in the applicants' proposals. The NPS goes on to recognise that this presumption is reversed (i.e assuming underground cable) when proposed developments will cross part of a nationally designated landscape (i.e. National Park, The Broads, or Areas of Outstanding Natural Beauty).

2.8.7 The NPS also sets out that the need to consider the case for undergrounding outside designated areas (2.9.23) and to consider, where there is the potential for significant adverse landscape and visual impacts (2.9.14), the need to have given due consideration to feasible alternatives to the overhead line. This could include, where

appropriate, re-routing, underground or subsea cables, and the feasibility e.g. in cost, engineering or environmental terms of these but with decision making taking into account the costs and benefits of the alternatives.

3. Need case

3.1 Background

3.1.1 The electricity industry in Great Britain is undergoing unprecedented change. Closure of fossil fuel burning generation and end of life nuclear power stations means significant additional investment in new generating and interconnection capacity will be needed to ensure existing minimum standards of security and supply are maintained.

3.1.2 Growth in offshore wind generation and interconnectors to Europe has seen a significant number of connections planned in Scotland and England, and significantly in areas of the East Coast of England, including in East Anglia and the South-East.

3.1.3 The Climate Change Act 2008 (as amended) now commits the UK Government by law to reducing greenhouse gas emissions by at least 100% from the 1990 baseline by 2050, strengthening the likelihood of most of these connections progressing to delivery. This 2050 target is commonly known as 'Net Zero'.

3.1.4 To achieve Net Zero, there will need to be a substantial shift away from the use of fossil fuel burning generation. This has led to investment in offshore wind generation, which will increase further in the future.

3.1.5 Historically, the transmission system was powered by coal powered generating stations. The increasing importance of low carbon generation has driven the closure of these generating stations, with more expected to close in the future. This generating capacity is being replaced by low carbon generation which is geographically located away from the coal powered generating stations. The transmission system must be updated to reflect the location of the generating stations.

3.1.6 Electricity demand is especially concentrated in large urban areas, including urban areas in the M62 corridor, the M18 corridor, the Midlands, the M4 corridor and the Southeast. The transmission system carries bulk energy from the generators to points on the network where that power is taken onto the distribution networks for onward transmission to homes and businesses across England and Wales. As the country decarbonises, this demand for energy will increase and replace fossil fuel usage.

3.2 National Electricity Transmission System Security and Quality of Supply Standard

3.2.1 NGET must comply with Section 9 of the Electricity Act and Standard Condition D3 (Transmission system security standard and quality of service) of its Transmission Licence. This means that where the boundary capacity of the Main Interconnected Transmission System (MITS) is exceeded against the standards, NGET must resolve the capacity shortfall under the terms of its Transmission Licence. The standards against which NGET assesses these shortfalls are set out in the "Design of the Main Interconnected Transmission System" section of the National Electricity Transmission System Security and Quality of Supply Standard (NETS SQSS).

3.2.2 The NETS SQSS also sets out in "Generation Connection Criteria applicable to the onshore transmission system" that connections to the transmission system must be secured to meet the identified requirements. Where the NETS SQSS applies, the generator(s) are considered part of a "generation group" for assessment against these criteria.

3.2.3 Generators apply to National Grid ESO for connections to the NETS in Great Britain. If the application is for an onshore generation connection, the applicant will indicate the specific location of the generating station, which will indicate the likely geographical connection to the transmission system. If the application is for an offshore connection or impacts multiple transmission owners, the ESO will coordinate the process known as CION /HND to determine the preferred connection option.

3.2.4 The ESO ensures the relevant onshore or offshore transmission owner undertakes generation connection process studies via the relevant process and makes a connection offer to the customer for a connection point and identifies the relevant infrastructure work needed to make the connection. Once this offer is signed the connection is recorded on the Transmission Entry Capacity (TEC) Register and forms a contractually binding connection location and timescale with which the transmission owner, such as NGET, is required to connect the generation customer or undertake the works to facilitate their connection.

3.2.5 A connection offer will normally be given in respect of a particular geographical area. Sometimes this leads to a presumption as to the connection point located on the existing transmission network. In other circumstances where there is no or little existing transmission infrastructure, this will require the provision of new infrastructure. The post connection offer assessment process enables further evaluation of the preferred connection option and refinement of the preferred overall transmission solution. This process continues, informed by evolving circumstances and consultation, until an application is submitted for development consent in relation to a transmission project.

3.2.6 NGET assesses the adequacy of its transmission system in accordance with the method defined in the NETS Security and Quality of Supply Standard (SQSS). We are required to assess power flows between regions of the transmission system (Planned Transfers). The Planned Transfer from the region is calculated by taking the Average Cold Spell (ACS) Peak Demand in the region and generation following the modelling set out in the NETS SQSS. The Planned Transfer is therefore the amount of power which will flow out of the region at ACS peak. Planned Transfer calculations will always consider the power flows for ACS peak demand conditions, as less generation will be entering the market when demand is lower.

3.2.7 Any transmission system is susceptible to faults that interfere with the ability of transmission circuits to carry power. Most faults are temporary, many are related to weather conditions such as lightning or severe weather, and many circuits can be restored to operation automatically in minutes after a fault. Other faults may be of longer duration and would require repair or replacement of failed electrical equipment.

3.2.8 Whilst some of these faults may be more likely than others, faults may occur at any time, and it would not be acceptable to have a significant interruption to supplies as a result of specified fault conditions, including combinations of faults. The principle underlying the NETS SQSS is that the NETS should have sufficient spare capability or "redundancy" such that fault conditions do not result in widespread supply interruptions. The level of security of supply has been determined to ensure that the risk of supply interruptions is managed to a level that maintains a minimum standard of transmission system performance. The faults we need to design the system to be compliant with are called "Secured Events".

3.2.9 The NETS SQSS defines the performance required of the NETS in terms of Quality and Security of Supply for secured events that at all times:

- Electricity system frequency should be maintained within statutory limits;
- No part of the NETS should be overloaded beyond its capability;
- Voltage performance should be within acceptable statutory limits; and
- The system should remain electrically stable.

3.3 Existing transmission network

3.3.1 The transmission system in East Anglia was primarily constructed in the 1960s, at the same time as much of the rest of the transmission system and has remained largely unaltered since.

3.3.2 The transmission system in East Anglia consists of a 212km loop of circuits connecting Walpole, Necton, Norwich Main, Bramford, Pelham and Burwell Main substations. This loop connects to the rest of the transmission system to the north at Walpole; south at the Twinstead Tee; and south and west at Pelham. The loop connects substations to the transmission system by more than one route, thereby improving security of supply for local demand and the reliability of connection for generation in the region.

3.3.3 The transmission system in East Anglia was built primarily to serve consumer demand from homes and businesses in the region. Peak demand by 2029/30 is anticipated to be approximately 1,767 MW (total for demand substations of Walpole, Norwich Main and Bramford and with only minor demand being consumed at Sizewell).

3.3.4 For many years the only significant power stations generating in the East Anglia region were the Sizewell A and the Sizewell B nuclear power stations, Spalding North and Sutton Bridge gas fired power stations, and some further smaller 132kV connected gas fired power stations.

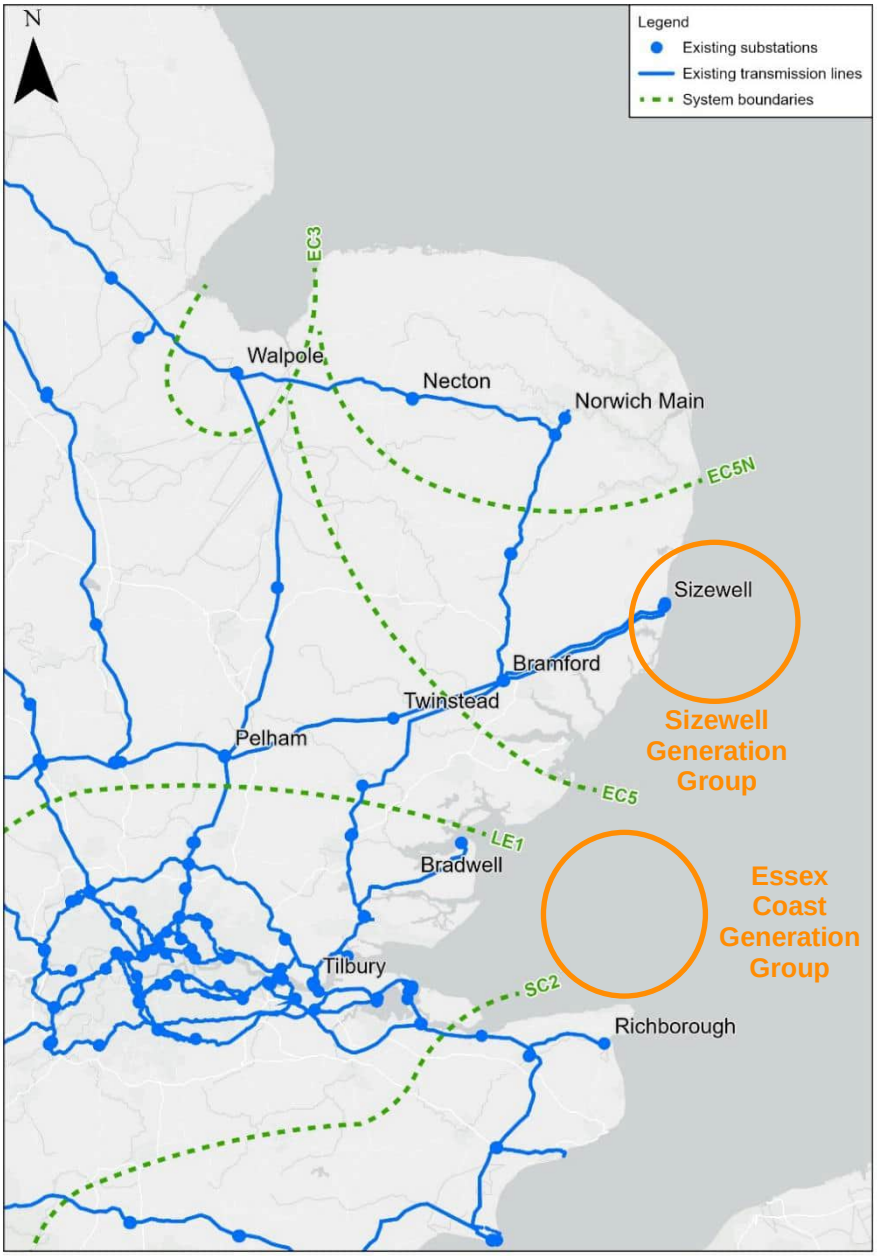
3.3.5 This generation capacity has recently been added to by several offshore windfarms with the existing generation totalling 7,687.4 MW of installed capacity. This is expected to grow substantially in coming years, as discussed further below.

3.3.6 The wider South East area, is made up of the 400kV and 275kV network which connects generation and demand in the major towns and cities of the wider South East and Midlands regions.

3.3.7 The existing transmission system in East Anglia and South East is shown in Figure 3.1 below,

3.3.8 All diagrams within the report show the existing system following the completion of the Bramford to Twinstead project, which is included in the background considered for this projects Needs Case. The Bramford to Twinstead project is still subject to its own Development Consent Order which commenced in April 2023. However, should consent be granted, the Bramford to Twinstead project is proposed to be constructed and operational, ahead of the connection of any proposed infrastructure within this report.

Figure 3.1 – East Anglia and South-East region transmission system and system boundaries



3.4 Need for future reinforcement of the East Anglia and South East transmission system

3.4.1 As discussed in the previous section, UK Government policy requires significant reinforcement of the transmission system to facilitate the connection of renewable energy sources and to transport electricity to where it is used. In particular, the British Energy Security Strategy sets targets for the connection of up to 50GW of offshore wind by 2030s as a key part of a strategy for secure, clean and affordable British energy for the long term.

3.4.2 NGET is responsible for ensuring compliance with the National Electricity Transmission System (NETS) Security and Quality of Supply Standards (SQSS), which sets out the criteria and methodology for planning and operating the system. In summary the reinforcement of East Anglia and South East is required for the following reason.

3.4.3 Without reinforcement the capacity of the East Anglia and South East existing network is insufficient to accommodate the connection of the proposed new power sources. The 'Thermal Boundary Export Limit' – the physical maximum energy capacity the system can accommodate during planned system faults – would be exceeded, preventing export of power to demand centres beyond East Anglia.

3.4.4 To address these SQSS compliance issues reinforcement of the network is required. Without reinforcement, in some conditions generators connecting in the area would be required to reduce their output. Generators would then have to be compensated via a 'constraint' payment, and additional payments made to non-constrained generators outside of the area to ensure that supply matches demand. These costs would be passed on to end consumers. ESO analysis shows that, in this case, predicted constraint costs are likely to significantly exceed those of reinforcement, providing a further driver to reinforce the system in addition to meeting the criteria of the SQSS.

3.4.5 The concept of 'boundary capacity and capability' plays an important role. A boundary notionally splits the system into two parts, crossing critical circuit paths that carry power between the areas where power flow limitations may be encountered. Where 'boundary capacity' – the capacity of the circuit(s) across the boundary – is exceeded against the standards, we must resolve the capacity shortfall. The standards against which NGET assesses these shortfalls are set out in the SQSS. This is described in more detail later in this section.

3.5 Demand and new generation connecting in East Anglia

3.5.1 Demand in East Anglia (demand taken at Walpole, Norwich and Bramford substations) is expected to increase from 1,411 MW in 2022/23 to 1,767 MW in 2029/30.

3.5.2 The demand in the North of East Anglia (Walpole and Norwich) is expected to increase from 1,062 MW in 2022/23 to 1,320 MW in 2029/30.

Table 3.1 – 2022 WK24 Forecast Demand for the East Anglia Region

	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30
East Anglia Demand (MW)	1,411	1,416	1,431	1,463	1,519	1,598	1,690	1,767
North East Anglia Demand (MW)	1,062	1,066	1,078	1,102	1,142	1,199	1,260	1,320

3.5.3 The increases in local demand are relatively modest while significant expansion of generation is expected in the region. In the East Anglia region, connection agreements have been signed in respect of 22,907.6 MW of new generation (total generation of 30,595 MW minus Existing Generation of 7,687.4 MW). These future connection agreements comprise a large volume of offshore wind generation (including East Anglia Offshore Wind), gas-fired generation, energy storage projects, and a nuclear power station (at Sizewell C). Table 3.2 below gives details with highlighted cells indicating change from the 2023 SOBR.

Table 3.2 – Planned Generation for East Anglia

Table 3.2 - Planned Generation for East Anglia
Generation Data from the ESO TEC registers as of 10/01/24
(#Generation in Sizewell genration group *Generation Impacting EC5N, $Generation using Fossil Fuels)

Completion Year	Generation Name	Substation	Plant Type	Total Installed Capacity (MW)	Availability Factor	Scaled Generation Capacity (MW)			
Existing	Sizewell B	Sizewell 400kV	Nuclear	1,230.0 MW	0.85	1,045.5 MW			#
Existing	Greater Gabbard Offshore Wind	Lieston 400kV	Wind	500.0 MW	0.7	350.0 MW			#
Existing	Great Yarmouth	Norwich 400kV	CCGT	420.0 MW	0.83	348.6 MW	*	$	
Existing	Sherringham Schoal Offshore Wind	Necton 400kV	Wind	315.0 MW	0.7	220.5 MW	*		
Existing	Gunfleet Sands II	Gunfleet	Wind	64.0 MW	0.7	44.8 MW			
Existing	Gunfleet Sands I	Gunfleet	Wind	99.9 MW	0.7	69.9 MW			
Existing	Kings Lynn A	Walpole 132kV	CCGT	395.0 MW	0.83	327.9 MW	*	$	
Existing	Sutton Bridge A	Sutton Bridge 400kV	CCGT	850.0 MW	0.83	705.5 MW	*	$	
Existing	Peterborough	Walpole 132kV	CCGT	245.0 MW	0.83	203.4 MW	*	$	
Existing	Spalding North Power Station	Spalding North 400kV	CCGT	950.0 MW	0.83	788.5 MW	*	$	
Existing	Spalding Energy Extension	Spalding North 400kV	OCGT	299.0 MW	0.83	248.2 MW	*	$	
Existing	Dudgeon Wind Farm	Necton 400kV	Wind	400.0 MW	0.7	280.0 MW	*		
Existing	Peak Gen	Walpole 132kV	AGT	20.5 MW	0.83	17.0 MW	*	$	
Existing	Race Bank Windfarm	Walpole 400kV	Wind	565.0 MW	0.7	395.5 MW	*		
Existing	Lincs Wind Farm	Walpole 400kV	Wind	265.0 MW	0.7	185.5 MW	*		
Existing	Galloper Windfarm	Sizewell 132kV	Wind	348.0 MW	0.7	243.6 MW			#
Existing	EPR Thetford	Bramford 400kV	Biomass	41.0 MW	0.83	34.0 MW			
Existing	East Anglia One	Bramford 400kV	Wind	680.0 MW	0.7	476.0 MW			
2022	Pivoted Power (Walpole)	Walpole 400kV	Energy Storage	49.9 MW	0.83	41.4 MW	*		
2022	Brook Farm BESS	Bramford 400kV	Energy Storage	49.9 MW	0.83	41.4 MW			
2023	Walpole Green Ltd	Walpole 400kV	Energy Storage	49.9 MW	0.83	41.4 MW	*		
2023	Pivoted Power (Bramford)	Bramford 400kV	Energy Storage	49.9 MW	0.83	41.4 MW			
2023	Bramford Green Stg 1	Bramford 400kV	Energy Storage	49.9 MW	0.83	41.4 MW			
2024	Yare Power	Norwich 400kV	Energy Storage	49.5 MW	0.83	41.1 MW	*		
2024	Ashgreen Norwich	Norwich 400kV	Energy Storage	49.5 MW	0.83	41.1 MW	*		
2024	Pivoted Power (Norwich)	Norwich 400kV	Energy Storage	57.0 MW	0.83	47.3 MW	*		
2024	ENSO Green Holdings	Walpole 400kV	Energy Storage	100.0 MW	0.83	83.0 MW	*		
2024	Bramford Green stg 2	Bramford 400kV	Energy Storage	7.1 MW	0.83	5.9 MW			
2024	LionLink (EuroLink)	Friston	Interconnector	1,600.0 MW	1	1,600.0 MW			#
2025	East Anglia Two	Lieston 400kV	Wind	860.0 MW	0.7	602.0 MW			#
2025	Kings Lynn B	Kings Lynn 400kV	CCGT	1,700.0 MW	0.83	1,411.0 MW	*	$	
2025	Vanguard	Necton 400kV	Wind	1,320.0 MW	0.7	924.0 MW	*		
2026	Hornsea Power Station 3 - Stg 1	Norwich 400kV	WInd	2,250.0 MW	0.7	1,575.0 MW	*		
2026	East Anglia One North	Lieston 400kV	Wind	860.0 MW	0.7	602.0 MW			#
2026	East Anglia Three	Bramford 400kV	Wind	1,200.0 MW	0.7	840.0 MW			
2026	Norfolk Boreas	Necton 400kV	Wind	1,320.0 MW	0.7	924.0 MW	*		
2027	Vanguard East 1	Necton 400kV	Wind	960.0 MW	0.7	672.0 MW	*		
2027	Equinor	Norwich 400kV	Wind	719.0 MW	0.7	503.3 MW	*		
2027	Nautilus	Lieston/Sizewell	Interconnector	1,500.0 MW	1	1,500.0 MW			#
2028	East Anglia Three pt 2	Bramford 400kV	Wind	100.0 MW	0.7	70.0 MW			
2028	Hornsea Power Station 3 - Stg 2	Norwich 400kV	Wind	750.0 MW	0.7	525.0 MW	*		
2028	Vanguard East 2	Necton 400kV	Wind	360.0 MW	0.7	252.0 MW	*		
2029	Bramford BESS	Bramford 400kV	Energy Storage	400.0 MW	0.83	332.0 MW			
2029	Sizewell C Stage 1	Sizewell 400kV	Nuclear	1,670.0 MW	0.85	1,419.5 MW			#
2030	Spalding Extension part 2	Spalnding North	OCGT	500.0 MW	0.83	415.0 MW	*	$	
2030	Race Bank Extension	Walpole	Wind	565.0 MW	0.7	395.5 MW	*		
2030	Sizewell C Stage 2	Sizewell 400kV	Nuclear	1,670.0 MW	0.85	1,419.5 MW			#
2030	Alcemi Bramford Battery	Bramford 400kV	Energy Storage	500.0 MW	0.83	415.0 MW			
2301	Equinor Stage 2	Norwich 400kV	Wind	231.0 MW	0.7	161.7 MW	*		
2031	Evolution Power Norfolk	Walpole 400kv	Energy Storage	860.0 MW	0.83	713.8 MW	*		
2031	Norwich Green Energy Centre	Norwich 400kV	Energy Storage	400.0 MW	0.83	332.0 MW	*		
2031	Norwich 100MW BESS	Norwich 400kV	Energy Storage	100.0 MW	0.83	83.0 MW	*		
Total Existing Generation (MW)				**7,687.4 MW**		**5,984.3 MW**			
Total Generation Sizewell gneration group # (MW)				**10,238.0 MW**		**8,782.1 MW**			
Total Generation Impacting EC5N* (MW)				**17,115.3 MW**		**12,903.1 MW**			
Total Genration Existing and Contracted with No Fossil Fuel Contribution $ (MW)				**25,215.5 MW**		**19,632.1 MW**			
Total Generation Existing and Contracted				**30,595.0 MW**		**24,097.1 MW**			
Forecast ACS Peak Demand 2029/30						**1,767.0 MW**			
Forecast ACS Peak Demand 2029/30 Impacting EC5N*						**1,320.0 MW**			
Existing Planned Transfer at ACS Peak with All Generation (Existing Generation - Existing Demand)						**4,573.3 MW**			
Transfer at ACS Peak with All Generation Sizewll Group (Total Generation# - No Demand in the group)						**8,782.1 MW**			
Minimum Transfer at ACS Peak with All Generation Impacting EC5N (Total Installed Generation* - Peak Demand*)						**11,330.3 MW**			
Maximum Transfer at ACS Peak with All Generation Impacting EC5N (Total Generation* - Peak Demand*)						**11,583.1 MW**			
Minimum Planned Transfer at ACS Peak with All Generation (Total Generation ($ excl fossil fuel) - Peak Demand)						**17,865.1 MW**			
Maximum Planned Transfer at ACS Peak with All Generation (Total Generation - Peak Demand)						**22,777.1 MW**			

3.6 Planned transfers

3.6.1 To assess SQSS compliance, NGET is first required to assess power flows between areas of the Transmission System. From a security of supply perspective ('Economy Planned Transfer'), we seek to ensure that transmission system infrastructure is adequate to meet national demand and customer generation requirements during operating conditions that could reasonably occur. It is generally the case that if the capacity of the transmission system is sufficient to meet Average Cold Spell (ACS) Peak demand it will have sufficient capacity to meet lower levels of demand.

3.6.2 The total generation capacity typically connected to the NETS exceeds maximum demand. This is known as 'Plant Margin'. Historically, Plant Margin has been a minimum 120% of peak demand (i.e. there is 20% more generation installed than required to meet demand). This allows the operation of generation below its maximum output to cover for breakdowns of generators, intermittency of energy source (wind) and to cover faults of generation while in service. Current generation market arrangements mean that simultaneous generation at maximum output is unlikely and NGET is, therefore, not required by SQSS to provide transmission system infrastructure capable of accommodating the total output from all connected generators.

3.6.3 The amount of power expected to be transferred between two areas of the transmission system during normal operation is referred to as the 'Economy Planned Transfer'. The Economy Planned Transfer is derived by applying an Availability Scaling Factor (or 'scaling factor') to the installed capacity of each power station according to the type of generation.

3.6.4 The SQSS defines the technique that should be used to scale generation outputs for certain types of generators. Generators with fixed scaling factors (DT) are:

- Nuclear and fossil fuel power with carbon capture and storage DT = 0.85
- Wind, Wave and Tidal DT = 0.7
- Pumped Storage DT = 0.5
- Interconnectors Considered importing at Peak DT = 1.0

3.6.5 Other plant types (such as gas turbines, biomass and energy storage) are not subject to fixed scaling factors in the SQSS. It is therefore necessary to make assumptions about the extent to which this generation would be available. As shown in Table 3.2 above, in the East Anglia Region, the Transmission Entry Capacity Register ('TEC') includes approximately 5GW of gas turbine (CCGT and AGT) plant, 3 GW of energy storage and a small amount of biomass (41 MW).

3.6.6 Typically, these sources of energy have been scaled in SQSS planning using a straight scaling factor of 0.83 (based on assumed plant margin at 120% - i.e. 1/120%). However, given the planned transition towards low-carbon sources of energy and the 2050 net zero target, this is likely to represent an overestimate as fossil fuel-based generators will gradually reduce their contribution and generation such as offshore wind will be more prevalent.

3.6.7 The assessment presented here therefore applies a range to the scaling factor for gas turbine generation. 0.83 is assumed as the top of the range (i.e. the maximum availability possible), and consideration that fossil fuel contribution will ultimately be phased out over the coming 25 years. Therefore, the bottom of the range assumes no contribution from fossil fuelled stations such as gas fired stations. Such a low availability

factor will likely represent a significant underestimate of the availability of gas plant given that significant amounts of current and contracted future generation will be connected to the system in the short to medium term. However, this is considered an appropriate approach to demonstrate the robustness of need for reinforcement.

3.6.8 The Planned Transfer from the region is calculated by taking the ACS peak demand in the region from the total scaled generation. The Planned Transfer is therefore the amount of power which will flow out of the region at ACS peak. Planned Transfer calculations will always consider the power flows for ACS peak demand conditions, as less generation will be entering the market when demand is lower.

3.6.9 The results of the analysis of the Economy Planned Transfer for the East Anglia region are shown in Table 3.2 above, which captures the latest forecast demand data for 2029/30 generation connection dates recorded on the TEC and Interconnector Register publicly available on the ESO website at the time of publication of this document. These show connections of generators and interconnectors up to 2031. Gas turbine generators are included with a scaling factor of 0.83 but as discussed above a minimum planned transfer figure has also been provided assuming contribution for gas fired station is zero.

3.6.10 The total maximum contracted scaled generation in East Anglia (i.e. including gas plant) at the time of maximum demand is forecast to be 24,097.1 MW as compared to a total of 30,595 MW of installed generation capacity. The demand in the region at the time of system peak will be 1,767 MW.

3.6.11 This results in a forecast maximum Planned Transfer in 2031 of 22,777.1 MW export (24,097.1 MW minus 1,767 MW).

3.6.12 The minimum forecast planned transfer with no contribution from fossil fuels in 2031 would be 17,865.1 MW export (19,632.1 MW minus 1,767 MW).

3.6.13 Both the maximum and minimum forecast planned transfers are significant increases on the existing Planned Transfer export condition of 4,573.3 MW.

3.7 Boundary capacity and capability

3.7.1 The capacity of the transmission system is based on the physical ability of electrical circuits to carry power. Each circuit has a defined capacity and the total capacity of the circuits in a region or across a boundary is the sum of all of the capacity of all the circuits.

3.7.2 The capability of the transmission system is the natural flow of energy that can occur in the infrastructure comprising the network. Due to the physical properties of the transmission system, this is often not as great as the theoretical capacity of the infrastructure in question.

3.7.3 Where power flows are constrained by the transmission system across a specific number of circuits, this is termed a “boundary” by the ESO. Such boundaries are used in the ETYS to identify constraints which may require changes to the transmission system in the next 10 years.

3.7.4 Groups of existing generating stations and / or proposed generating stations connecting in a particular geographical area of the transmission system are known as ‘generation groups’. These are considered when assessing the network for compliance with the generation connection criteria of the NETS SQSS.

3.7.5 Where capacity and capability of the transmission system are not sufficient, either from a generation group or across a boundary, we will be required to reinforce the network. It does this by either modifying the existing network (if possible) and / or constructing additional transmission infrastructure to resolve the shortfall.

3.7.6 The East Anglia and South East regions have a number of system boundaries which determine the capability of the network to accommodate demand and generation.

3.7.7 The boundaries impacted as part of the need case shown in Figure 3.1 for this document are as follows:

- EC3 – Walpole Area (generation group)
- EC5N North – North of East Anglia (generation group)
- EC5 – East Anglia Boundary
- Sizewell (generation group)
- Essex Coast (generation group)
- LE1 – North London Boundary
- SC2 – South Coast Connection boundaries

East Anglia fault and impact on Boundaries EC5N and EC5

3.7.8 For the East Anglia region, the worst-case fault is the loss of the Walpole – Burwell – Pelham double circuits as shown in Figure 3.2. The SQSS requires the transmission system to manage the planned transfers in Table 3.3. Under this fault condition network flow remains in a southerly direction with generation from Spalding North to the south flowing in the direction of Bramford substation.

3.7.9 In this situation the circuits across EC5N and EC5 must be capable of exporting the power generated in each of those areas along with the energy entering from Spalding North. Table 3.3 below shows the planned transfer required with the capability of the boundary based upon the capacity of the export circuits from EC5N and EC5. This table shows capacity across the EC5 boundary including the completion of the Bramford to Twinstead project.

Figure 3.2 – East Anglia fault and impact on Boundaries EC5N and EC5

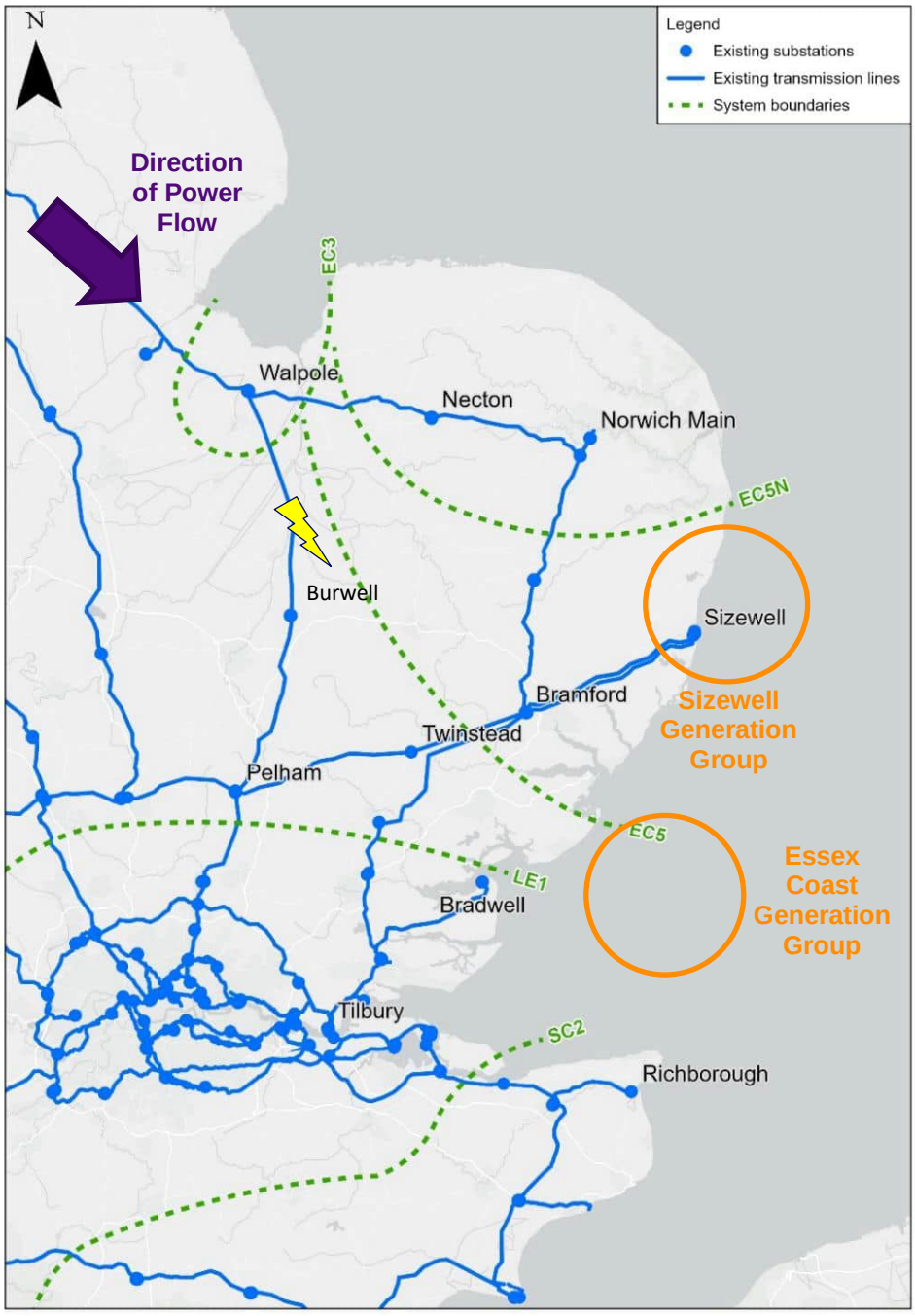


Table 3.3 – Planned Transfer requirements

Planned Transfer		Post Fault Capability by 2031	Planned Transfer Boundary Deficit
EC5N (Maximum)	11,583.1 MW	6,652 MW	-4,931 MW
EC5 (Maximum)	22,777.1 MW	13,552 MW	-9,225 MW
EC5N (Minimum*)	11,330.3 MW	6,652 MW	-4,678 MW
EC5 (Minimum)	17,865.1 MW	13,552 MW	-4,313 MW

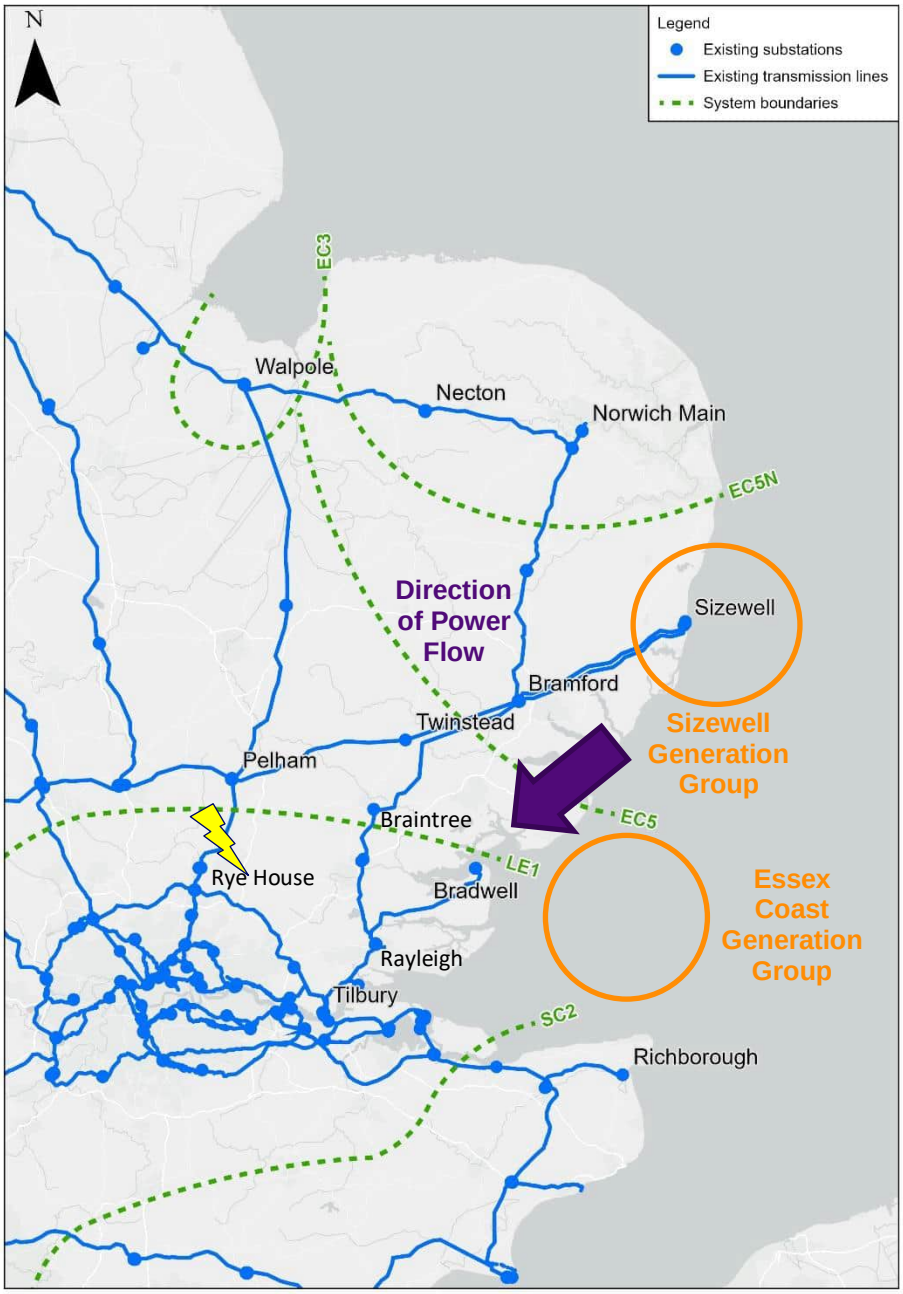
3.7.10 Table 3.3 above shows the maximum transfer required while fossil fuel gas fired power stations contribute to the system. The minimum levels assume gas fired power stations are not contributing.

3.7.11 *EC5N minimum level is set to all remaining low carbon generation at full output as the generation criteria requires the generator being considered at full output, and all others in the group set to a level which ought reasonably to be expected. As these generators are all wind, if conditions are perfect for full output in the region, they all would be maximising output. However even at this level the reinforcement is required.

3.7.12 As described earlier the minimum levels are unlikely to occur as the gas plant will continue to contribute to the energy system for the next 25 years and when this generation does close it will be replaced by further new generation connecting to the grid. However, it is a good test to show that under all circumstances system reinforcement is required across EC5 and EC5N in the range of 5,000 MW to 9,225 MW across and out of the East Anglia region. The SQSS requires us to design the network to accommodate the upper range value of 9,225 MW.

LE1 Boundary Fault and Impact

Figure 3.3 – LE1 Boundary Fault and Impact



3.7.13 The region south of the EC5 boundary is the proposed connection location of the North Falls 1000 MW and Five Estuaries 1080 MW wind farms.

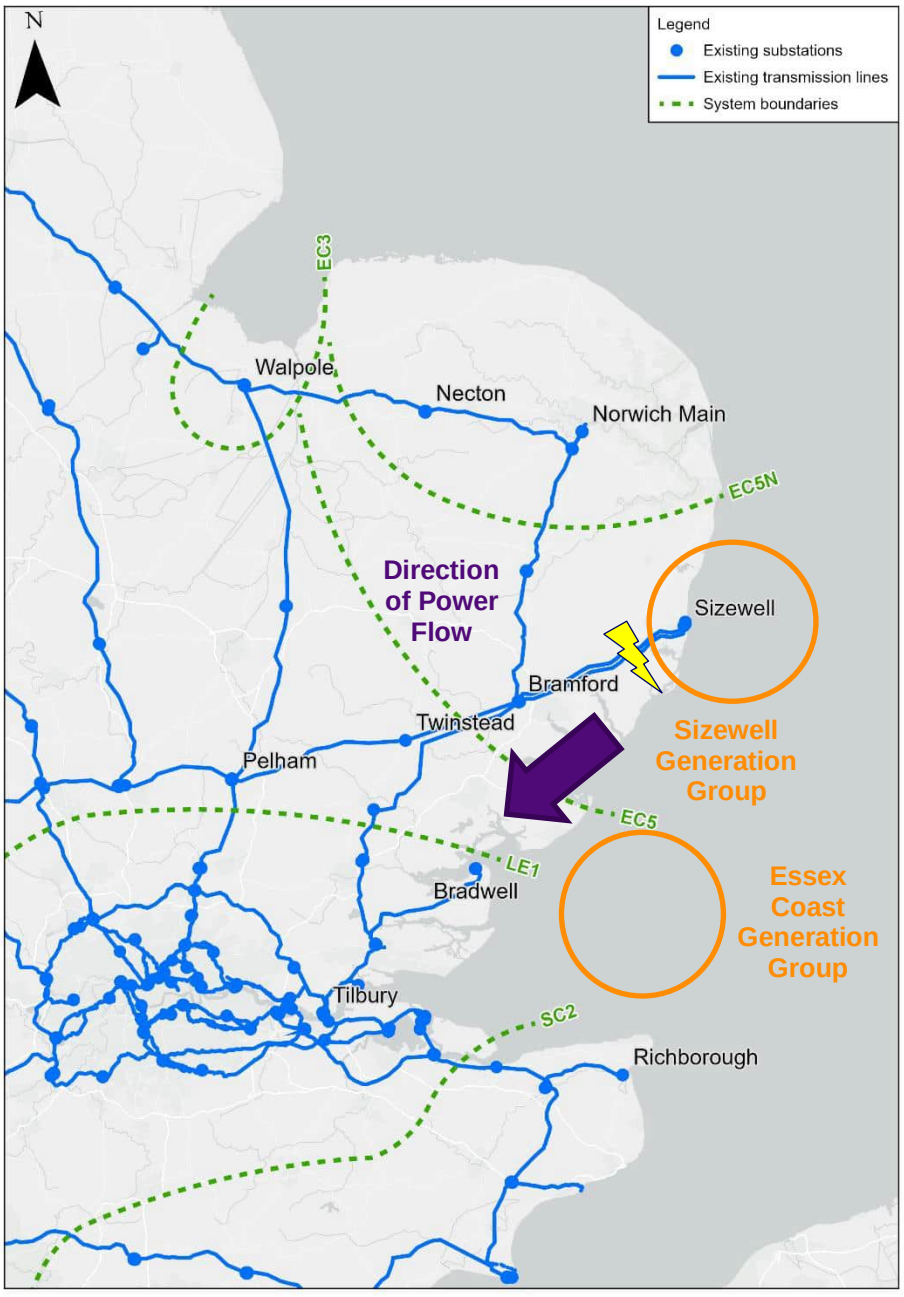
3.7.14 For the LE1 boundary the worst case fault is for the Pelham – Rye House double circuit as shown in Figure 3.3. During this fault the East Anglia generation will naturally seek to flow down the Bramford – Braintree – Rayleigh circuits causing them to overload above their maximum potential capability of 6380 MW. These circuits experience loadings in the order of 11,000 MW with a deficit of -4,620 MW of capability.

3.7.15 With a requirement to provide additional 2,856 MW [(1000MW + 1080MW)x0.7 + 1400MW] for the connection of North Falls, Five Estuaries and Tarchon as described as the Essex Coast Generation Group below increasing the deficit to -7476 MW.

3.7.16 This deficit along with two generators seeking connection in the area shows there is insufficient capacity across this part of the LE1 boundary and requires reinforcement.

Sizewell Generation Group

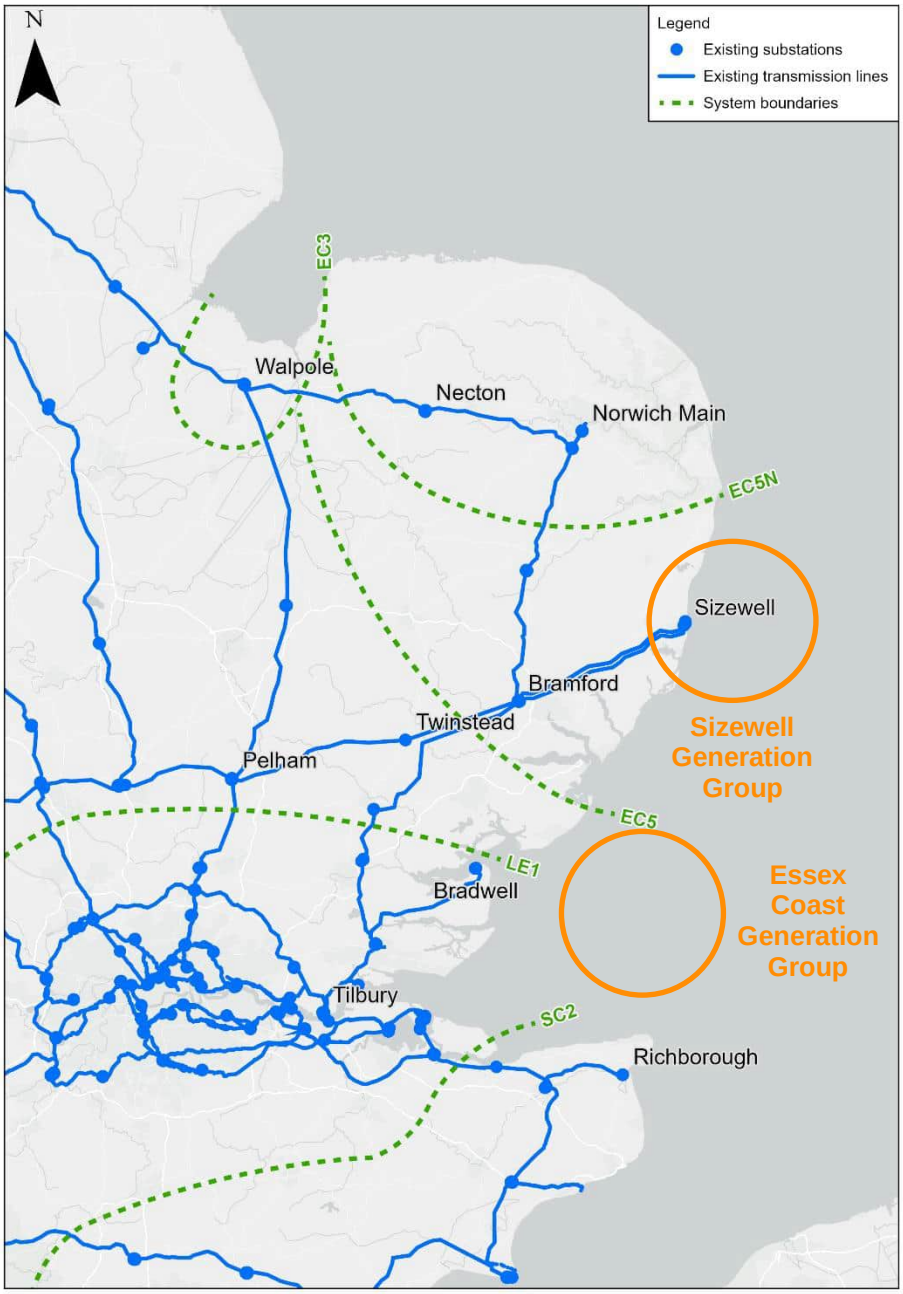
Figure 3.4 – Sizewell Generation Groups fault and impact



3.7.17 For the Sizewell generation group the worst-case fault is for one of the two double circuits connecting Bramford to Sizewell as shown in Figure 3.4. This leaves the remaining circuit with a maximum potential capability of 6,930 MW and generation transfer of 8,782.1 MW leaving a deficit of more than -1852.1 MW. This requires the Sizewell generation group to be reinforced for this condition.

Essex Coast Generation Group

Figure 3.5 – Essex Coast Generation Need



3.7.18 National Grid also has contracted connections for new generation and interconnectors located off the Essex Coast with proposed connections between the EC5 boundary and the LE1 boundary. The 3 proposed connections are as follows: -

- Tarchon Energy Limited Interconnector (1400 MW By 2030)
- North Falls offshore Windfarm (1000 MW by 2030)
- Five Estuaries Offshore Windfarm (1080 MW by 2030)

3.7.19 These connections are proposed to be made to the network at a location which can accommodate the combined 3480 MW of total generation. This requires a minimum of 3 transmission circuits to connect the generation to meet the requirements of the NETS SQSS.

SC2 Boundary

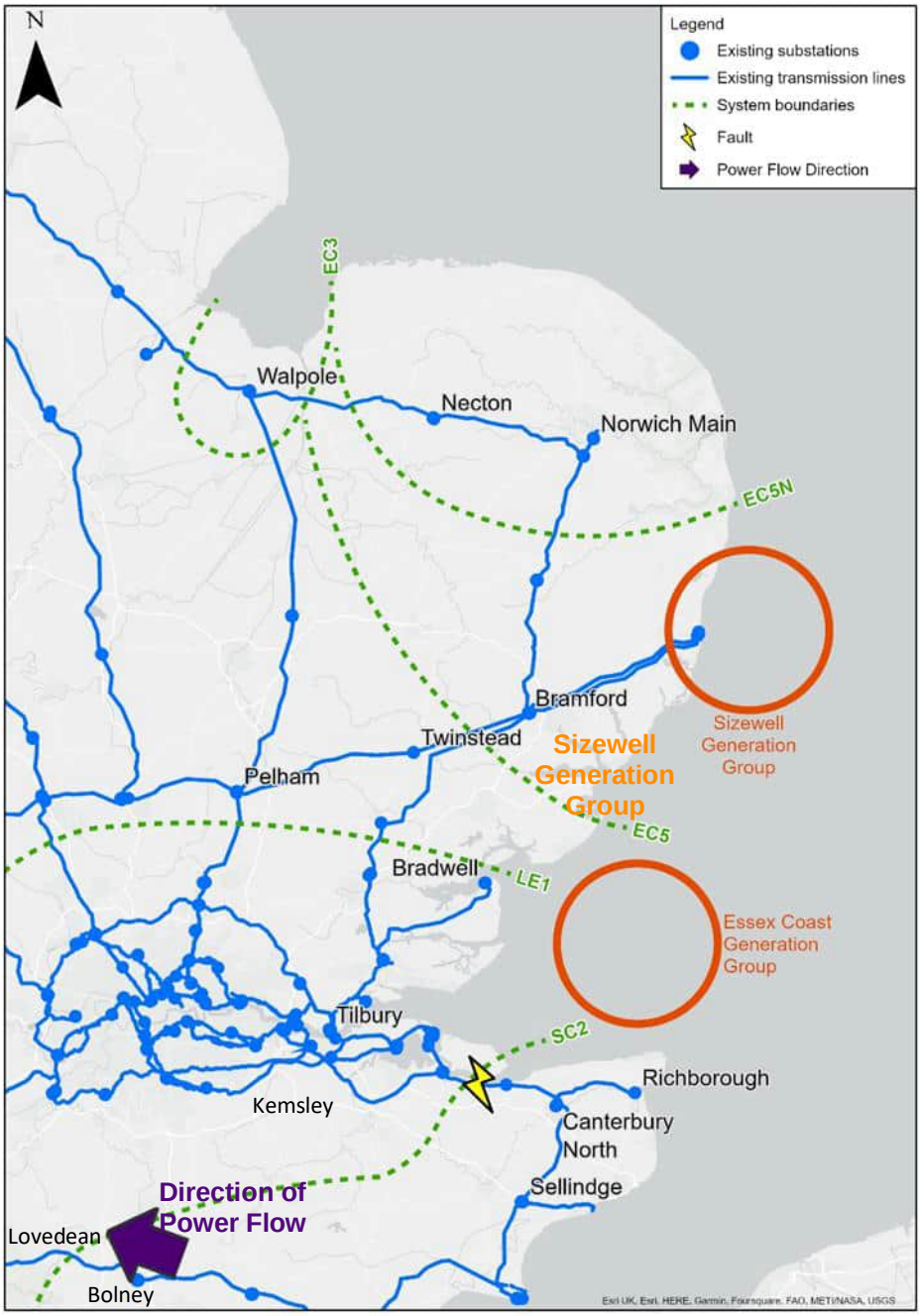
3.7.20 Table 3.4 shows the existing and contracted generation expected to connect in within the SC2 boundary of Kent by 2031. The existing SC2 boundary capability is 4500MW with the capability limited by thermal and voltage stability issues. The existing planned transfer from the SC2 boundary is 4,313MW, with +200MW of capacity available.

Table 3.4 – Planned Generation and Planned Transfer for Boundary SC2

Table 3.4 - Planned Generation and Planned Transfer for Boundary SC2 (Kent Area)
Generation Data from the ESO TEC registers as of 03/10/23
(#Nuclear and CCGT gneration)

Completion Year	Generation Name	Substation	Plant Type	Total Installed Capacity (MW)	Availability Factor	Scaled Generation Capacity (MW)
Existing	Eleclink	Sellindge	Interconnector	1,000.0 MW	1	1,000.0 MW
Existing	IFA Interconnector	Sellindge	Interconnector	2,000.0 MW	1	2,000.0 MW
Existing	Nemo Link	Richborough	Interconnector	1,020.0 MW	1	1,020.0 MW
Existing	London Array	Cleve Hill	Wind	630.0 MW	0.7	441.0 MW
Existing	UK power reserve ltd	Sellindge	CCGT	10.0 MW	0.83	8.3 MW
Existing	Dungeness B	Dungeness	Nuclear	1,120.0 MW	0.85	952.0 MW
Existing	Shoreham VPI Power	Bolney	CCGT	420.0 MW	0.83	348.6 MW
2024	Cleve Hill Solar Park	Cleve Hill	PV Solar	350.0 MW	0.7	245.0 MW
2024	Pivoted Power Sellindge	Sellindge	Energy Storage	49.9 MW	0.7	34.9 MW
2024	Bolnley Green	Bolney	Energy Storage	49.9 MW	0.7	34.9 MW
2025	ENSO Green Holdings ltd	Canterbury North	Energy Storage	49.9 MW	0.7	34.9 MW
2025	Sheaf Energy Ltd	Richborough	Energy Storage	249.0 MW	0.7	174.3 MW
2027	Pivoted Power Bolney	Bolney	Energy Storage	49.9 MW	0.7	34.9 MW
2027	Kulizumboo Interconnector	Canterbury North	Interconnector	700.0 MW	1	700.0 MW
2029	Blue Plannet Solar	Dungeness	PV Solar	500.0 MW	0.7	350.0 MW
2029	Low Carbon Solar Park 14 ltd	Dungeness	PV Solar	500.0 MW	0.7	350.0 MW
2029	Ninfield Greener Grid Park	Ninfield	Energy Storage	49.9 MW	0.7	34.9 MW
2030	Orron Energy Development	Sellindge	PV Solar	1,000.0 MW	0.7	700.0 MW
2031	Newchurch SSE Utility Solutions ltd	Dungeness	PV Solar	400.0 MW	0.7	280.0 MW
2031	Ninfeild Green Energy Centre ltd	Ninfield	PV Solar	600.0 MW	0.7	420.0 MW
2031	Hookers Farm BESS	Bolney	Energy Storage	250.0 MW	0.7	175.0 MW
Total Existing Generation (MW)				6,200.0 MW		5,769.9 MW
Total Generation Impacting SC2 (MW)				10,998.5 MW		9,338.9 MW
Total Generation Impacting SC2 (MW) (Minus Life Limited Dungeness B & CCGT)				9,448.5 MW		8,030.0 MW
Forecast SC2 ACS Peak Demand 2029/30						1,456.0 MW
Existing Planned Transfer at ACS Peak with All Generation (Existing Generation - Existing Demand)						4,313.9 MW
SC2 Transfer at ACS Peak 2031 all generation						7,882.9 MW
SC2 Transfer at ACS Peak 2031 all generation (Minus Life Limited Dungeness B & CCGT)						6,574.0 MW

Figure 3.6 – SC2 boundary fault and impact



3.7.21 For the SC2 Boundary group the worst-case fault is for the double circuits connecting Canterbury North to Kemsley as shown in Figure 3.6, with the remaining circuit capability being 4,500 MW and maximum capacity the two circuits between Bolney to Lovedean being 5,873 MW. The transfer required by 2031 excluding existing nuclear and CCGT is 6,574 MW. This is in excess of both the capability and capacity of SC2 causing both overloads and voltage stability issues on the south coast.

3.7.22 There will be 4,720 MW of interconnectors in this region along with 4,728 MW of renewable generation and storage. This leaves the remaining double circuit with 4,500 MW capability and 5,873 MW of capacity and planned transfer of 6,574 MW leaving a deficit of between 701 – 2,074 MW.

3.7.23 This requires the SC2 boundary to be reinforced for this condition. Whilst provision of additional voltage support can increase circuit capability by circa 300 MW, this would require -1,800MW of capacity from the SC2 area.

3.8 Need case conclusion

3.8.1 As described above there are five distinct issues that need to be resolved by system reinforcements:

- Provision of 9,225 MW of capacity across East Anglia EC5 Boundary and 4,931 MW of capacity across EC5N Boundary
- Provision of 7,476 MW of capacity across the LE1 Boundary
- Provision of 1,852 MW of capacity to the Sizewell Generation Group
- Provision of 3,480 MW of connection capacity from the Essex Coast Generation Group
- Provision of 1,800 MW of capacity from the SC2 Boundary Group.

3.8.2 The remainder of this report considers the backcheck, review and interactivity of options to resolve the need case set out above. NGET must comply with Section 9 of the Electricity Act and Standard Condition D3 (Transmission system security standard and quality of service) of its Transmission Licence failing to resolve the need would breach this requirement.

4. Identification of strategic options

4.1 Introduction

4.1.1 When a need to reinforce the transmission system is established, we bring together a multi-disciplinary scheme team to evaluate a wide range of options. This team produces a list of strategic options which can be further refined through evaluation processes and which are described within this report. The scheme team keeps the options under review as changes to the drivers emerge. Through this review, options can be modified, or deselected and new options can be added. This section provides the chronological history of the options that are evaluated in this Strategic Options Backcheck and Review and how the process has been used to arrive at this list.

4.2 Corridor and Preliminary Routeing and Siting Study

4.2.1 In 2022, as part of the wider Network Planning Process, we carried out an initial assessment of the strategic options available to meet the need case set out in Section 3 above. This drew on the economic analysis of the ESO in the NOA process, and was presented in the April 2022 Corridor and Preliminary Routeing and Siting Study (CPRSS). This assessment identified 27 combinations of circuit options across a wide geographical area, later reduced to 23 (3 for west, 5 for north and 15 for east). For example, 'East 7' was a combination of AENC (Norwich – Bramford), ATNC (Bramford – Tilbury), SCD1 (Richborough – Sizewell) and TENC (Tilbury – Grain).

4.2.2 For each of these combinations of options we undertook an appraisal of deliverability, considered the system benefit that the reinforcement provided, and considered environmental and socio-economic factors. We considered whether in-principle environmental and socio-economic constraints with the potential to materially affect strategic options were present. We concluded that none were significant enough to materially influence strategic option selection. For example, whilst some relatively extensive areas of built development are present (Ipswich, Colchester etc) they can be avoided. In the case of national landscape designations (e.g. Dedham Vale; Suffolk Coast and Heaths; Surrey Hills; Kent Downs) we considered the relative location of these in combination with the potential to adopt alternative technology to OHL meant that none presented a barrier to development or indicated an option should not be progressed. Further detail of this exercise is given in the CPRSS.

4.3 NOA Cost Benefit Analysis

4.3.1 As part of the annual NOA cycle, each combination of options proceeded through the Cost Benefit Analysis (CBA) carried out by the ESO. This used the 'BID3' economic model, which is an economic dispatch optimisation model that simulates European energy markets, including demand, supply and infrastructure. It models the hourly generation of all power stations on the system, taking into account factors such as fuel prices, historical weather patterns and operational constraints. This allows avoided predicted constraint costs to be calculated for each option across the range of FES, based on their costs and delivery dates. The ESO's role, and both NOA and the FES, are discussed in Section 2 above.

4.3.2 Predicted constraint savings from each pathway were compared to the capital costs to assess whether 1) investment is economically optimal versus a 'do nothing' counterfactual (i.e. no capital costs are expended and constraint costs are incurred), and 2) if so, which option/pathway is economically optimal. Net Present Value (NPV) is calculated by deducting the present value of capital costs from the present value of predicted constraint costs for each option in each FES. Options were compared using a 'Least Worst Regrets' method, being ranked in order of the highest (i.e. worst) regret for each option, in comparison to all other options, across the four FES (i.e. if an option was the best in all FES, its Least Worst Regret would be 0).

4.3.3 Table 4.1 below shows the outcome of this analysis.

Table 4.1 – ESO Least Worst Regrets Analysis per Option in £m.

Reinforcement Strategy Option	*Net Regret Cost by FES[6] (£m)*				*Worst Regret Cost (£m) ordered by least-worst regret*
	CT	*LW*	*SP*	*ST*	
East	36	143	51	0	143
North 5	233	340	248	197	340
East 3	296	556	0	355	556
East 15	499	664	96	504	664
East 6	0	0	711	155	711
East 9	819	914	710	606	914
East 8	863	995	737	692	995
East 2	746	1,000	422	803	1,000
East 14	923	960	1,126	730	1,126
North 2	804	789	1,314	709	1,314
East 10	1,237	1,330	1,111	1,028	1,330
North 1	687	654	1,376	664	1,376
East 11	1,549	1,642	1,423	1,340	1,642
West 3	1,477	1,660	1,428	1,374	1,660
East 13	1,691	1,820	1,549	1,524	1,820
East 12	1,715	1,749	2,315	1,685	2,315
West 2	1,413	1,430	2,951	1,646	2,951
North 4	1,458	1,228	3,705	1,718	3,705
West 1	1,487	1,421	3,978	1,908	3,978
North 3	1,909	1,678	4,151	2,165	4,151
East 4	2,159	1,812	5,083	2,453	5,083
East 5	2,179	1,661	6,515	2,645	6,515
East 1	2,633	2,114	6,961	3,096	6,961

4.3.4 This economic assessment led to investment recommendations on whether individual reinforcements should proceed.

[6] The four Future Energy Scenarios as described in the 2020 versions of the Future Energy Scenarios. The scenarios are: Steady Progression (SP) - slowest credible decarbonisation; System Transformation (ST) – Hydrogen for heating; Consumer Transformation (CT) – Electrified heating; and, Leading the Way (LW) – Fastest credible decarbonisation.

4.3.5 The NOA analysis showed that combinations of options to the East and North were economically optimal, and that onshore overhead line options are preferred to offshore HVDC solutions.

4.3.6 The highest ranking option from an economical perspective, with an LWR of £143m, was the 'East 7' option. The schemes included in the East 7 option are shown below with their columns being project description and cost, NOA code, proposed option, circuit technology.

Table 4.2 – Strategic Combination Proposal East 7

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

4.3.7 The 'East 6' option is similar to East 7 with TENC excluded (i.e. AENC, ATNC and SCD1 only). This is the LWR option in two of the FES scenarios tested (Leading the Way and Consumer Transformation).

4.3.8 The second highest ranking option was 'North 5', incorporating ATNC, SCD1 and TENC (as per East 7), but with NPNC Necton-Pelham OHL replacing AENC.

4.3.9 Third highest ranked was 'East 3', incorporating ATNC and TENC (as per East 7), but with NTDC Necton-Tilbury HVDC Cable (Onshore) and CAKE Canterbury-Kemsley AC OHL.

4.3.10 The best performing option in the West ('West 3'), combining ATNC and TENC with NCDC Norwich-East Claydon HVDC OHL (Onshore), IBNC Iver-West Weybridge-Bolney AC OHL (Onshore) had an LWR of £1,660m.

4.4 CPRSS conclusion

4.4.1 Taking all factors into account, the balanced conclusion across the range of scenarios was that the preferred reinforcement solution was provided by Option East 7. This solution combined offshore and onshore connections with three distinct elements: an offshore reinforcement between the south coast and East Anglia (SCD1); onshore reinforcement between Tilbury and Grain (TENC); and onshore reinforcement between Norwich and Tilbury (AENC/ATNC) via Bramford substation and a new East Anglia Connection Node substation.

4.5 NOA and HND recommendations

4.5.1 AENC, ATNC and SCD1 were subsequently given proceed signals in NOA 2021/22, and the July 2022 NOA Refresh also identified these reinforcements as 'Holistic Network Design essential' (HND essential) options. TENC does not have a proceed signal nor is it considered as required currently in the NOA Refresh and is therefore not being taken forward at this time. It does not form part of the Norwich to Tilbury project.

4.5.2 The analysis for the NOA and HND provided a solid foundation for identifying strategic options that are most viable and should be taken through further analysis.

5. Options assessment process

5.1.1 National Grid has published "*Our Approach to Consenting*" which sets out how we develop our strategic proposal. We apply the following approach to evaluate options we take forward.

5.1.2 Firstly, we identify if our existing network could be modified or enhanced to deliver the required connection or increase in capacity.

5.1.3 If we identify there is a need that is beyond the capability of our existing network, as clearly set out in our project need case, we consider strategic options to provide the required increase in capacity.

5.1.4 We apply a technical filter as part of this assessment to ensure any solution meets the need, either individually or as part of a wider group of reinforcements. There are many ways to achieve increases to our network capability. To allow us to focus on those that best meet our obligations to the environment and consumers we apply a "benefits filter", which ensures any option we present has a comparable benefit over an alternative. The criteria for an option to be considered are any of the following:

- an environmental benefit;
- a technical system benefit; or
- a capital and Circuit Lifetime Cost benefit.
- Where the benefits of options are very similar to each other, options will be included for appraisal to ensure we capture possible solutions that are of very similar capability.

5.1.5 All options taken forward for appraisal are evaluated in respect of environmental constraints, socio-economic effects, technology alternatives, capital and Circuit Lifetime Costs. Undertaking this appraisal ensures stakeholders can see how we have made our judgments and balanced the relevant factors in accordance with our legal duties.

5.1.6 The assessment process considers the following areas:

- Environmental assessment topics which consider whether there are environmental constraints or issues of sufficient importance to influence decision making at a strategic level, having particular regard for internationally or nationally important receptors.
- Socio economic topics which consider whether there are socio economic constraints or issues of sufficient importance to influence decision making at a strategic level, having particular regard for internationally or nationally important receptors.
- Consideration of technical benefits includes, whether the option is providing the required capacity to meet the need case; whether the option has particular system benefits over alternatives; whether the option introduces any system complexity that would cause system operability issues.
  - Capital and Circuit Lifetime Costs considers a range of factors, which are listed below;
  - Capital cost of the substation and wider works
  - Capital cost of the circuit costs for each technology appraised

5.1.7 Circuit Lifetime Costs, including circuit capital cost, cost of loses over 40 years and cost of operation over 40 years.

5.1.8 When considering each strategic option, we estimate circuit cost information for the following technology options for all land-based options:

a) 400 kV alternating current (AC) overhead line

b) 400 kV AC underground cable

c) 400 kV AC gas insulated line (GIL)

d) 525 kV high voltage direct current (HVDC) underground cable and converter stations

5.1.9 When considering each strategic option, we provide circuit cost information for the following technology options for all offshore based options:

a) 400 kV AC Offshore cable

b) 525 kV HVDC Offshore cable and converter stations

5.1.10 A full evaluation and costs used in our assessments can be found in the Appendices.

5.1.11 In this appraisal, all options are considered using information appropriate to this stage of their development on the assumption that they are deliverable in a reasonable timescale. Timescales and deliverability would only be considered further in the assessment process should they become differentiating factors in the selection of the option that best meets our environmental and legal obligations. If these issues of delivery timescales and risk do become differentiating factors in selection of an option, the issue would be set out clearly in the options conclusion. If it is not differentiating the factor will not be considered further for this assessment.

5.1.12 At the initial appraisal stage, we prepare indicative estimates of the capital costs. These indicative estimates are based on the high-level scope of works defined for each strategic option in respect of each technology option that is considered to be feasible. As these estimates are prepared before detailed design work has been carried out, we make equivalent assumptions for each option. Final project costs for any solution taken forward following detailed design, consenting and mitigation will be in excess of any high-level appraisal cost. However, all options would incur these increases proportional to initial estimate in the development of a detailed solution. This methodology ensures that all options for appraisal proposes are compared on a like for like basis.

5.1.13 Strategic options are identified at a very high level as being electrical solutions between geographic points. Therefore, the potential circuit lengths are derived by taking a straight-line distance between the points and adding 20% to accommodate potential route deviations that might be required if the route proceeds forward to more detailed routeing and siting. Where a clear obstacle exists such as an estuary, water course or geographical feature an alternative route length will be derived and explained in the option. Where an offshore alternative is presented, straight lines will be used to a mid-point offshore and 20% added to provide variation in route length.

5.1.14 These initial option lengths do not define route corridors, and environmental appraisal is provided over a wide study area between points of connection. Any routes for circuit technologies to take would be subject to detailed routeing and siting for any strategic option taken forward as a preferred option(s).

5.1.15 The options in the following sections of this report have been taken forward in this document as they meet the need case and have been selected using the methodology set out above.

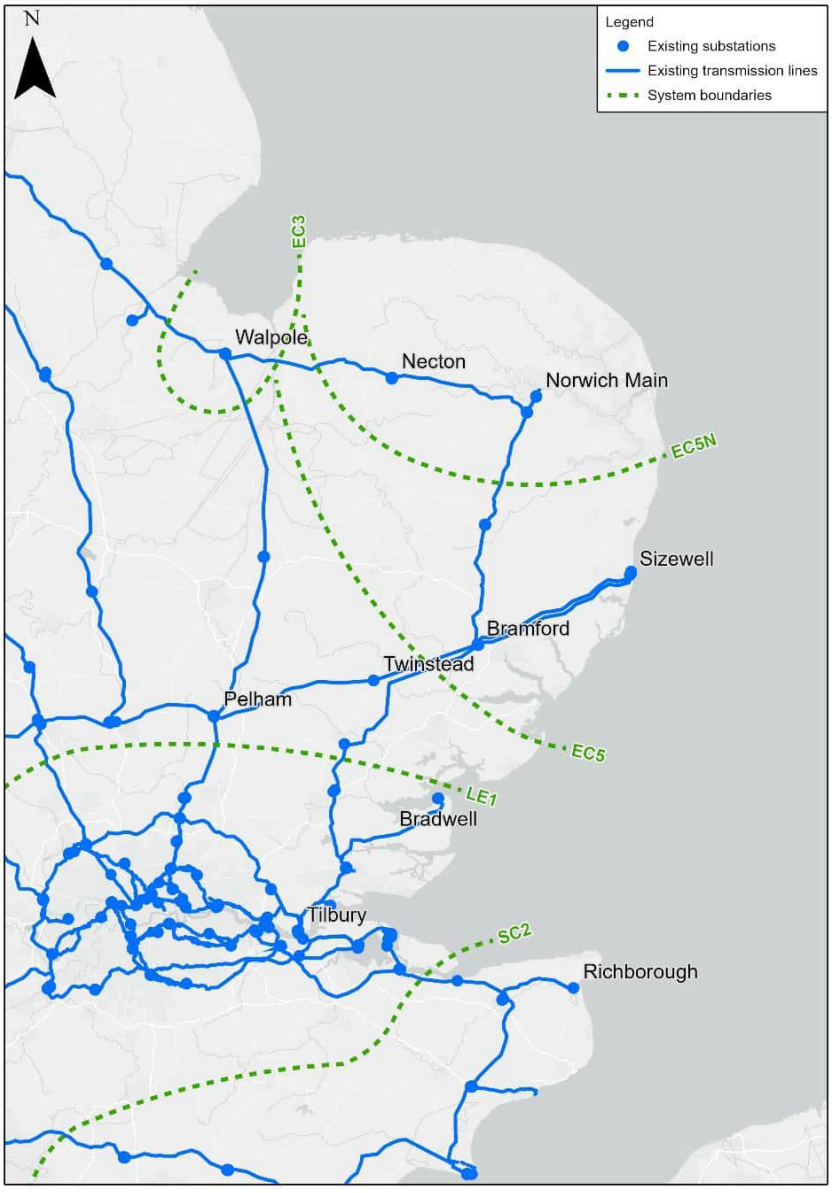
6. Strategic options overview

6.1 Introduction

6.1.1 As described in Section 3 above, the transmission system is in need of reinforcement to ensure ongoing SQSS compliance as the volume of generation connecting in the area increases.

6.1.2 Figure 6.1 below shows the transmission network in the East Anglia and the South East region including all works completed to maximise existing system capability including Bramford to Twinstead new overhead line, due for commissioning in 2028, which is required to meet the needs of earlier connections of generation and interconnectors.

Figure 6.1– Considered East Anglia and South East Transmission System and system boundaries



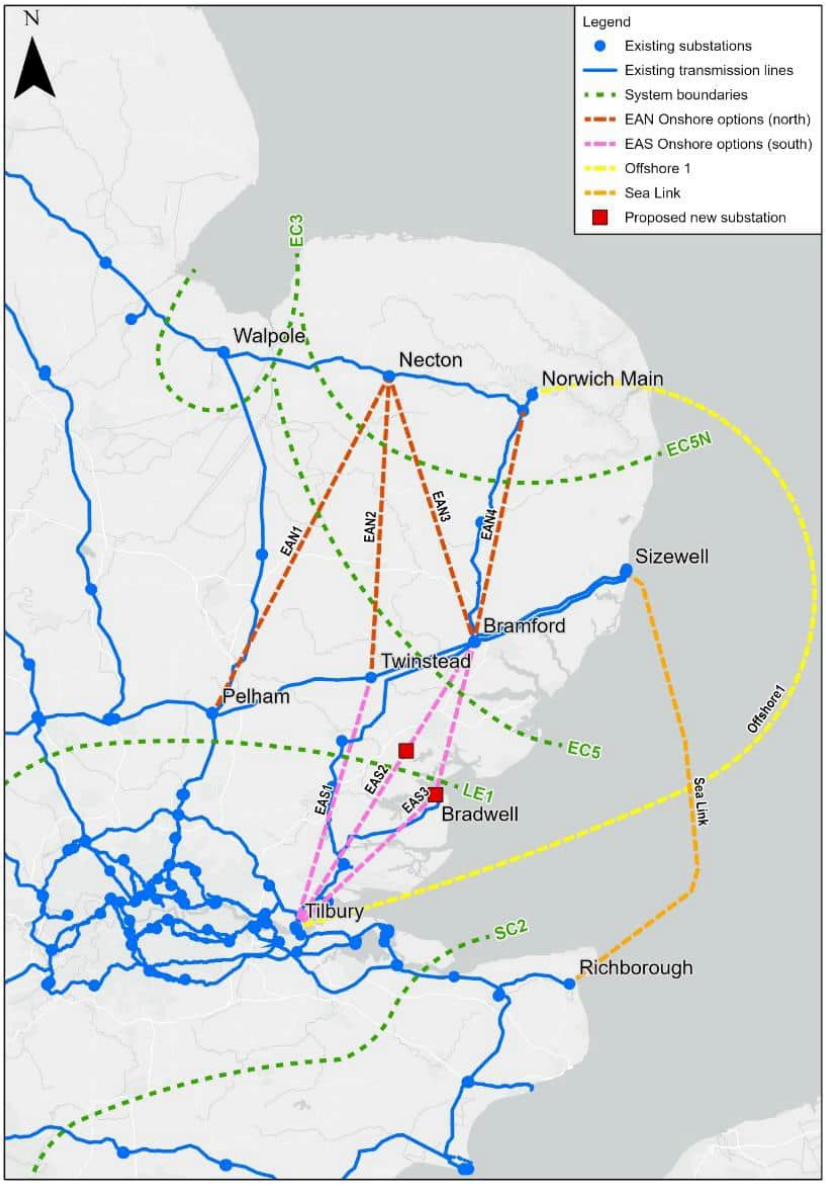
6.2 Connection options considered for detailed appraisal

6.2.1 In line with Our Approach to Consenting, this Strategic Options Backcheck and Review is designed to test the assumptions and interim conclusions made to date based on the latest information available.

6.2.2 A combination of options is required to resolve individual power constraints across the boundaries indicated in Figure 6.1. Firstly, solutions to resolve capacity shortfalls across EC5 North, then across EC5 and LE1 combined. SC2 causes an additional impact due to the need to support energy flow directly into the area for high interconnector export scenarios seen consistently in FES.

6.2.3 The report reviews each individual circuit option which can provide solutions to the North and East, including some additional options that did not form part of the previous analysis, as indicated below. Options in the West have not been carried forward to this stage in the process on the basis of the 'benefits' filter, given that the CPRSS and NOA CBA process showed these options to be significantly suboptimal, or because they offered no benefits over other options (e.g. a Norwich-Necton option offered no benefits over those northern options listed below).

Figure 6.2 – Connection options



6.2.4 The onshore options to resolve EC5 North boundary requirements are:

- EAN 1 – Necton to Pelham **115km** (NPNC in the previous analysis)
- EAN 2 – Necton to Twinstead **90km** (not included in the previous analysis)
- EAN 3 – Necton to Bramford **85km** (not included in the previous analysis)
- EAN 4 – Norwich Main to Bramford **80km** (AENC)

3.1.7 An offshore option, crossing boundaries EC5 North, ECN5 and LE1, is also considered:

- Norwich to Tilbury

6.2.5 As discussed earlier in the report, we are also currently evaluating detailed options for the full resolution of the need across boundaries SC2, LE1, EC5 and Sizewell generation group. As discussed in Section 4, a project know as Sea Link (NOA code SCD1) is also being taken forward to provide capacity across these boundaries. This project is subject to its own Options Report to determine the specific option to be taken forward. However, given the interactions with potential options in East Anglia, this report assesses the interaction of Sea Link (or its alternatives) with the proposed solution. This will demonstrate how all options considered in this report, in conjunction with the interactivity with Sea Link satisfy the overall need case outlined in Section 3.

6.2.6 The table below sets out the combinations that are required and which boundary or group condition they support.

Table 6.1 – Combination of Options required to meet need

<table>
<tr><th>Boundary or Group</th><th colspan="4">Onshore Options</th><th>Offshore</th></tr>
<tr><td>EC5N & EC3</td><td>EAN 1</td><td>EAN 2</td><td>EAN 3</td><td>EAN 4</td><td rowspan="2">Offshore 1</td></tr>
<tr><td>EC5 & LE1</td><td colspan="2">EAS 1</td><td colspan="2">EAS 2</td><td>EAS 3</td></tr>
<tr><td>SC2, EC5, LE1 & Sizewell</td><td colspan="5">SCD1 Sea Link (or alternative)</td></tr>
</table>

6.2.7 Any combination of North, South and SCD1 Sea Link circuits can be used to meet onshore need. Offshore 1 and SCD1 Sea Link required to meet offshore need. This means that Sea Link is required in all cases.

6.3 Updated costs

6.3.1 The costs for both onshore and offshore options included within this report have been updated to account for the latest information and are provided in a 2020/2021 price base. For ease of reference, we have also included the customer connection costs within the total. The methodology we have used is set out in Appendix D. This full backcheck and review of all options supersedes any information provided prior to April 2023.

6.3.2 We have previously provided cost information for comparison between onshore and offshore technologies, most recently to the Offshore Electricity Grid Task Force (OffSET). All previous costs were given for circuits only. This analysis specifically

identified that offshore connection costs of at least £500m had not been included in the costs. The cost of options included in this report have been updated to ensure that both the onshore and offshore substations required to make all connections are included within the option cost. This enables the reader to fully understand the comparable option cost, without having to adjust any numbers manually.

6.4 Study areas

6.4.1 Plans showing the onshore study areas used for the environmental and socio-economic appraisal are included in Appendix G.

6.5 East Atlantic Flyway Nomination as WHS

6.5.1 National Grid has noted the UK government's nomination, of various areas of the east coast as part of the East Atlantic Flyway UNESCO World Heritage Site (WHS). This would bring together a coastal network of wetlands and protected spaces that include Marine Protected Areas, Ramsar Sites, Special Protection Areas and Special Areas of Conservation.

6.5.2 National Grid's current assumption is that, if the nomination is successful, then any future management plan, would comprise similar protections to those applying to these designated sites as at present. The existing designations and protections were considered as part of routeing and siting as set out in the CPRSS, and as such it is not considered that the potential WHS designation is inconsistent with or would be undermined by the proposals. National Grid will update its position as further information becomes available.

6.5.3 On this basis, the previous assessments considering the current protections lead to the same conclusion as if the East Atlantic Flyway WHS designation was confirmed.

6.6 Strategic Options

6.6.1 The following sections of this report deal with each strategic option individually detailing environmental, socio-economic, technical and cost appraisals.

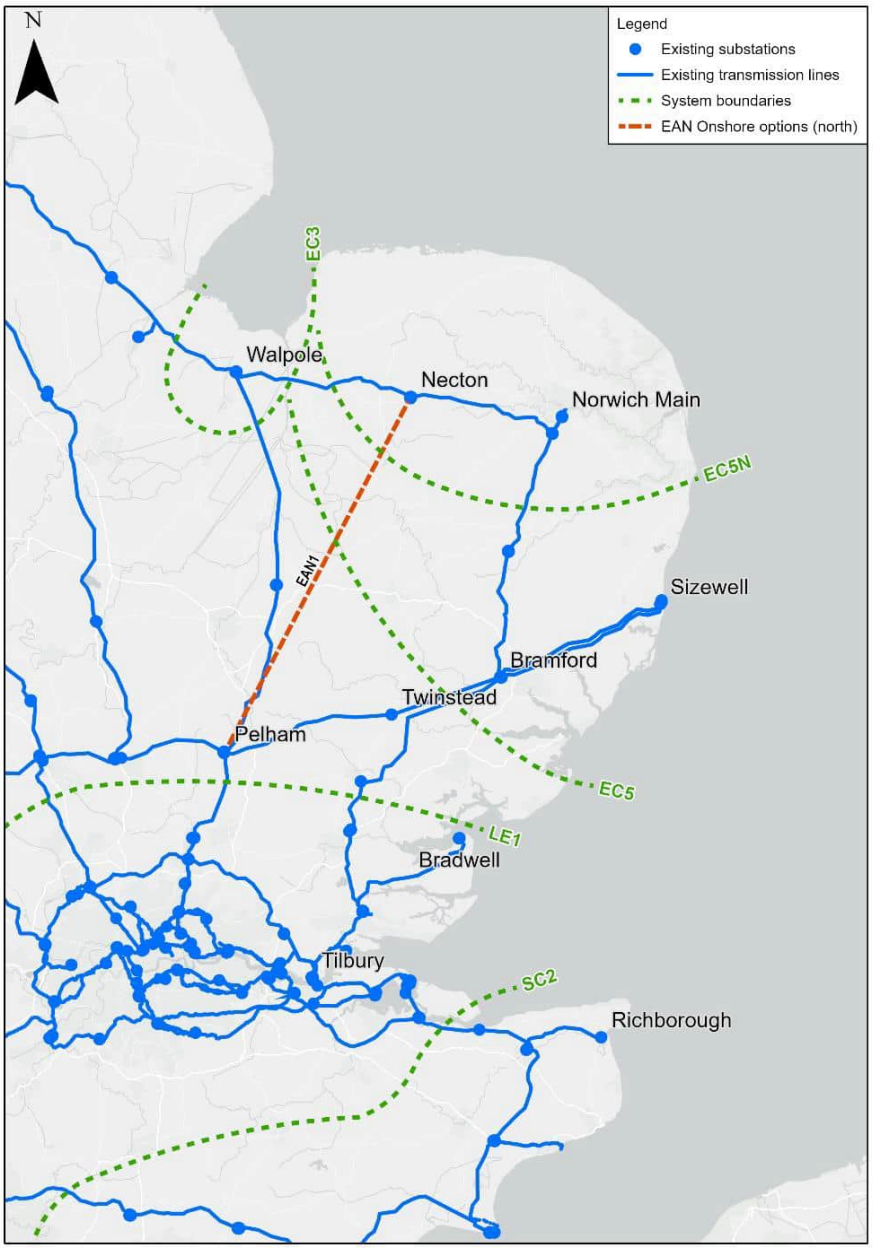
7. EAN1 – Necton to Pelham

7.1 Introduction

7.1.1 Strategic option EAN 1 involves a new 400kV transmission connection between the existing Necton substation and the existing Pelham substation, a distance of approximately 115 km. Shown in Figure 7.1.

7.1.2 The location of Pelham means that, to convey power further south from this location, further reinforcement of southern circuits would be required, including the need to reinforce Twinstead substation should this option be taken forward.

Figure 7.1 – Option EAN 1 Necton to Pelham



7.2 Environmental appraisal

Landscape and visual

7.2.1 Much of the study area comprises constraints to an AC OHL, some of which can be addressed by conventional approaches e.g. routeing.

7.2.2 Whilst it should be possible with this option to avoid some potential adverse effects on the landscape and visual amenity, it is likely some significant residual effects are possible, for residents along affected settlement edges and scattered properties, and for Registered Parks and Gardens due to the number present within the study area.

7.2.3 This option is moderately to heavily constrained in relation to landscape and visual considerations, with a number of opportunities to avoid constraints and for mitigation through more detailed assessment, siting and installation which would prevent and/or reduce potential for significant landscape and visual effects, but a number of adverse effects may remain.

7.2.4 There may be opportunity for paralleling existing OHLs to reduce the spread of infrastructure in the south of the study area. Due to the number of settlements and Registered Parks and Gardens it may be challenging to find a route which achieves a parallel alignment. An additional line may result in increased 'wirescape' on approach to Necton and Pelham. Four existing 400kV OHLs converge on Pelham Substation.

Historic environment

7.2.5 Scheduled monuments are distributed throughout the study area and include sites dating from the prehistoric period onwards. While examples of scheduled monuments have been recorded throughout the study area, there is a significant number in the southern half of the study area including many linear scheduled monuments. Many of these are ditches or dykes, and at least five straddle the A505 and the A41 between Newmarket and Royston, although another long dyke lies on the western side of Brandon in the northern half of the study area.

7.2.6 Although 'non-linear' scheduled monuments are located throughout the study area, concentrations have been identified in the northern limits and the southern half of the study area, with relatively few around the South Levels and the eastern side of the Bedford Levels. It is assumed this lack of scheduled monuments is linked to the wet low-laying nature of this landscape which has made settlement activity difficult at various times during the last 10,000 years.

7.2.7 Listed buildings have been recorded throughout the study area, with the vast majority being Grade II listed, although a relatively large number of Grade I and II* buildings have been recorded due to the size of the study area. The focus of these are the settlements scattered throughout the study area, although Grade II listed buildings have also been recorded throughout the landscape.

7.2.8 A number of registered parks and gardens have also been recorded throughout the study area, although, as with the scheduled monuments, these are focused in the southern half and northern limits of the study area. Specific concentrations include two Grade I listed landscapes in the southern limits of the study area, as well as several Grade II and II* listed landscapes around Newmarket, Cambridge, and Saffron Walden.

7.2.9 Although a review of non-designated assets was not undertaken as part of this appraisal, the Defence of Britain data set was examined, and a relatively large number of assets were recorded in the study area. These include a large concentration of defensive structures running from Cambridge to Saffron Walden, with another focus between Ely/Littleport and Bury St. Edmunds. A third concertation has been identified in the north between March and Downham Market, and all of these clusters appear to have formed parts of 'Stop Lines' constructed during the Second World War.

7.2.10 It is likely that designated assets, such as scheduled monuments and listed buildings would be avoided. Physical impacts are likely to be limited to non-designated assets and previously unrecorded assets, although these were not assessed as part of this options appraisal.

7.2.11 Whilst designated assets are likely to be avoidable when considered in isolation to other topic constraints, due to the linear nature of a number of the designated scheduled monuments avoidance is likely to introduce multiple angles to an AC OHL route.

7.2.12 There is the potential for significant impacts on the setting, with high value designated assets identified throughout the study area. This includes the parks and gardens in the southern and northern sections of the study area, as well as the scheduled monuments and listed buildings throughout the study area. The National Trust holding at Wicken Fen should also be avoided if possible.

7.2.13 Mitigation would be required and could include a phased programme of works including geophysical survey, archaeological evaluation trenching, and full archaeological excavation to mitigate physical impacts. The design of any above ground infrastructure required, as well as screening/planting, could potentially mitigate impacts on the setting of designated assets.

Ecology

7.2.14 Statutory designated sites for nature conservation are likely to be avoidable within this study area.

7.2.15 A principal consideration is the Breckland Special Protection Area (SPA)/Special Area of Conservation (SAC)/Site of Special Scientific Interest (SSSI) complex which is located within the northwest of the study area. Whilst these sites are avoidable there is the potential for impacts on the interest features associated with both habitats and species for which the sites are designated both during construction and operation. Avoidance of the Breckland network of sites would also require a longer AC OHL due to the location of this complex to the south of Necton.

7.2.16 Routeing would need to consider bird flight paths associated with the Breckland network of sites. Recognised mitigation measures for AC OHL impacts to bird assemblages would need to be used wherever appropriate. Mitigation for impacts of AC OHL connections on bird populations are available, such as bird diverters, but no methods exist that eliminate the potential for collision and avoidance behaviour, or displacement of bird populations. Recommended measures for mitigating for bird collision and mortality from AC OHL prioritise eliminating exposure by undergrounding sections where there is a greater risk or routeing the AC OHL away from important bird areas. Secondary measures for reducing likely impacts to birds from AC OHL include installing bird diverters and embedding measures into the design (e.g., insulated components, greater air space between lines).

7.2.17 The potential for a likely significant effect on these sites would need to be considered in relation to the Conservation of Habitats and Species Regulations 2017.

7.2.18 Whilst designated sites are likely to be avoidable, to avoid the linear designated sites such as Roman Road, Fleam Dyke, Devil's Dyke) it is likely that this could introduce multiple angles into an AC OHL route.

Physical environment

7.2.19 Any AC OAC route between Necton and Pelham substations would have to cross over several unavoidable watercourses and that of its floodplains. Given the extent of Flood Zones 2 & 3, across the entire study area, it is likely that a significant amount of development would be located within the floodplain. As flood water can ingress around pylon footprints this is unlikely to result in a significant effect once operational, however temporary impacts could arise where construction works are located within these zones.

7.2.20 Crossings of main rivers, flood zone 2 or 3 and Source Protection Zone 3 are likely to be unavoidable.

7.2.21 Significant operational effects are unlikely however a principal consideration is the management of construction works within Flood Zones 2 and 3.

7.3 Socio-economic appraisal

Settlements and populations

7.3.1 There are fourteen main settlements within the study area and smaller settlements scattered throughout.

7.3.2 The south of the study area is more densely populated with multiple urban settlements which could impact on the ability to route an AC OHL in this area without multiple angles or near to settlements.

7.3.3 Temporary adverse impacts could arise if the AC OHL is situated within proximity to settlements during construction associated with noise, air quality and construction traffic. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal.

Tourism and recreation

7.3.4 There are a number of National Cycle Networks (NCN) routes within this study area, one section of the Peddar's Way and Norfolk Coast Path National Trail runs through the study area and there are five Country Parks within the study area, the three largest are located around Cambridge. A National Trust holding at Wicken Fen is also present within this study area and should be avoided.

7.3.5 There is the potential for temporary adverse effects associated with severance should cycle routes need to be temporarily closed during construction, however this is likely to be the case with any option, and effects would be temporary. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal on users of NCN, and these effects would be permanent.

7.3.6 Standard best practice guidelines should be followed to provide appropriate signage, diversion routes and notice for the users of the cycle route and national trails should part of a cycle route or national trail be closed during construction.

Land use

7.3.7 Known BMV land (Grade 1 and 2) is present in the study area. Grade 1 BMV land is concentrated in the northwest and could be avoided should routeing extend close to the eastern border. Grade 2 BMV land is scattered throughout this study area and is considered unavoidable. Loss of BMV likely to be limited for the AC OHL route.

7.3.8 There is the potential for temporary adverse impacts on agricultural land during construction. There is the potential for permanent loss associated with pylon footprints, but this is unlikely to be significant. Other land uses are likely to be avoidable.

7.3.9 Standard best practice guidelines should be followed to reinstate agricultural land following construction.

7.3.10 Golf courses, Countryside Rights of Way Access Land Parcels and Forest and Country Parks should be avoided by routeing where possible.

Infrastructure

7.3.11 The M11 Motorway is located in the southeast, although avoidable it is considered likely the M11 would need to be crossed. There are five trunk roads within this study area. The A47 is located in the north and would not be affected. Four trunk roads are located in the south including the A1, A11, A14 and A428. The A14 extends across the study area from east to west, this would be unavoidable. It is considered the M11 and A11 would need to be crossed within this study area.

7.3.12 There are several railway lines running through the study area. At least three railway lines would be unavoidable within this option.

7.3.13 Port of King's Lynn is located in the northwest corner. There are 22 airports including Biggleswade Airfield, Cambridge International Airport, Chatteris Airfield, Duxford Airfield, Lakenheath Airfield, Little Grandsden Airfield, RAF Mildenhall, Stansted Airport, The Egerton-Smith Centre, Top Farm Airfield and 12 unnamed airports. With careful routeing ports and airports are avoidable.

7.3.14 Where crossings of other infrastructure is required, there is the potential for temporary closure of roads during construction. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal on users of roads and railways.

7.3.15 Standard best practice guidelines should be followed to provide appropriate signage, diversion routes and notice to the public who use the roads should these be temporary closed during construction.

7.3.16 The route would have to pass over gas transmission pipelines, these areas could require additional cathodic protection methods.

7.3.17 Routeing of a new AC OHL would have to take account of the 22 airports, aerodromes and MOD airport (including any associated low flying zone) located within this study area. Potential requirement for routeing away from exclusion zones and aviation warning lighting on the top of the transmission towers if their location is considered a significant navigational hazard.

7.4 Technical scope and costs

7.4.1 Technical analysis of option EAN 1 is as follows:

- This option to connect a 115km circuit between Necton and Pelham, takes energy west to Pelham located North of London.
- Due to the location of Pelham to convey power further south from this location will require further reinforcement of southern circuits including the need to reinforce Twinstead substation should this option be taken forward.

7.4.2 We undertake a cost evaluation of the following four technologies for onshore options evaluation.

a) 400 kV alternating current (AC) overhead line

b) 400 kV AC underground cable

c) 400 kV AC gas insulated line (GIL)

d) 525 kV high voltage direct current (HVDC) underground cable and converter stations

7.4.3 Option EAN 1 requires the following transmission works to satisfy the requirements of the SQSS.

- **New circuit requirements**
  - AC connections options use hi-capacity double circuits (two 400 kV AC circuits) with a total capacity of up to 6930 mega volt amperes (MVA) or;
  - HVDC using 525 kV 2000 MW voltage source links, which would require a convertor station at each end similar in size to a large warehouse. A 6000 MW connection would require three convertor stations at each end, six overall. This is to come close to matching the AC hi-capacity circuits of 6930 MVA.
  - The original assessment minimum HVDC requirement to connect contracted generation, with no ability to accommodate future applications is 4000 MW capability requiring two convertor stations at each end included in brackets () in the table.
- **Substation works**
  - Extension to Necton 400kV Substation by 2 bays to accommodate new circuits.
  - Extension to Pelham 400kV Substation by 2 bays to accommodate new circuits.

Table 7.1 – below sets out the capital costs for option EAN 1 considering substation works and each technology option.

Item	Need	EAN 1 Capital Cost			
Substation Works	Facilitate generation and connect new circuits	£36.8m			
New Circuits		**AC OHL**	**AC Cable**	**AC GIL**	**HVDC (Min 4000 MW rating)**
New Circuit 115 km	New Circuit across EC5 North	£457.7m	£4,959.1m	£4974.9m	£2,669.2m (£1,799.5m)
Total Capital Cost		**£494.5m**	**£4,995.9m**	**£5,011.7m**	**£2,706.0m (£1,836.3m)**

7.4.4 Table 7.2 below sets out the Circuit Lifetime Cost for the new circuit options, the Circuit Lifetime Costs are different for each circuit technology and are included as a differentiator between technologies. These costs are calculated using the methodology described in Appendix D.

Table 7.2 – EAN 1 Circuit Lifetime Cost Summary

Land Based option	EAN 1 AC OHL	EAN 1 AC Underground Cable	EAN 1 AC GIL	EAN 1 HVDC (Min 4000 MW rating)
Capital Cost of New Circuits	£457.7m	£4,959.1m	£4,974.9m	£2669.2m (£1,779.5m)
NPV of cost of losses over 40 years	£322.6m	£246.9m	£149.8m	£471.2m (314.1m)
NPV of operation & maintenance costs over 40 years	£6.7m	£23.4m	£6.8m	£172.4m (£114.9m)
Circuit Lifetime Cost of new circuits	**£787m**	**£5,229m**	**£5,131m**	**£3,313m (£2,209m)**

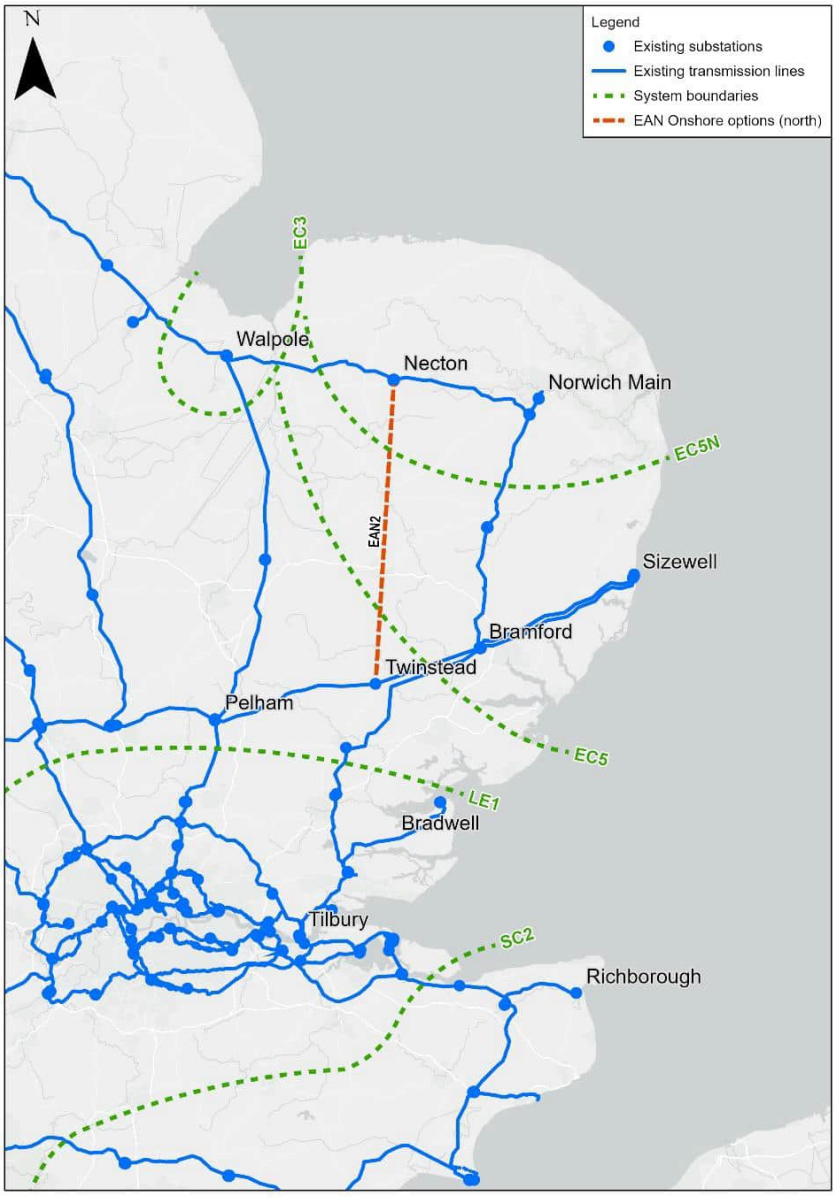
8. EAN2 – Necton to Twinstead

8.1 Introduction

8.1.1 Strategic option (SO) EAN 2 involves a new 400kV transmission connection between existing Necton substation and a New Twinstead substation, a distance of approximately 90 km. shown in Figure 8.1.

8.1.2 Currently the proposed Twinstead substation is a small connection of demand connection to the local Distribution Network Operator. This site is not sufficient for the connection of new circuits, so a new larger site would need to be established to facilitate the connection of multiple circuits, the number of which would depend upon the combination of options selected to satisfy the need case set out in this report.

Figure 8.1 – Option EAN 2 Necton to Twinstead



8.2 Environmental appraisal

Landscape and visual

8.2.1 If the study area comprises relatively limited constraints to an AC OHL which can be addressed by conventional approaches. However, the central part of the study area has a cluster of sensitive receptors, and it may be challenging to find a direct route without additional mitigation such as undergrounding. Whilst it should be possible with this option to avoid a good proportion of potential other adverse effects on the landscape and visual amenity, some significant residual effects are possible for residents along affected settlement edges and scattered properties.

8.2.2 As with all the options, route alignment/siting would be required to mitigate potential effects on landscape and visual receptors. The larger settlements to the east and west of the study area could be avoided through sensitive routeing. Sensitive routeing at the crossing of the Peddar's Way and Norfolk Coast Path could help to reduce the potential effect on users of the National Trail. The cluster of Registered Park and Gardens (RPGs) and a Country Park centrally in the study area and higher concentration of RPGs may require additional mitigation such as undergrounding.

8.2.3 This option is moderately constrained, with several opportunities to avoid constraints and for mitigation through more detailed assessment, siting and installation which would reduce potential for significant landscape and visual effects, but several adverse effects may remain.

8.2.4 This option would not offer any close parallel opportunities.

Historic environment

8.2.5 Designated sites are distributed throughout the study area, although the majority of listed buildings are within settlements such as Thetford, Bury St Edmunds and Ixworth. Scheduled monuments are located throughout the study area, although large clusters have been identified in the northern part of the study area with large sites including Woodcock Hall Roman town and Roudham deserted medieval village. Other clusters have been recorded near Thetford.

8.2.6 Like the other high value assets, RPGs are located throughout the study area, although large key sites include Shadwell Park and Euston Park near Thetford, and Kentwell Hall and Melford Hall near Sudbury in the south.

8.2.7 Many military defences have also been recorded, including large concentrations running from north to south through the southern half of the study area from Bury St Edmunds to Sudbury, with a second cluster from Thetford to Ixworth. These appear to represent parts of “Stop Lines” constructed during the Second World War. Other non-designated assets have not been considered as part of this assessment.

8.2.8 It is likely that designated assets, such as scheduled monuments and listed buildings would be avoidable. Physical impacts are likely to be limited to non-designated assets and previously unrecorded assets, although these were not assessed as part of this options appraisal.

8.2.9 There is the potential for significant impacts on the setting of high value designated assets identified throughout the study area.

8.2.10 Mitigation would be required and could include a phased programme of works including geophysical survey, archaeological evaluation trenching, and full archaeological excavation to mitigate physical impacts. The design of any above ground infrastructure required, as well as screening/planting, could potentially mitigate impacts on the setting of designated assets.

Ecology

8.2.11 Statutory designated sites for nature conservation are likely to be avoidable within this study area.

8.2.12 A principal consideration is the Breckland SPA/SAC/SSSI complex which is located within the western half of the study area. Whilst these sites are likely to be avoidable this would require an increased length of AC OHL in order to connect at Necton so as to avoid the sites by routeing to the east.

8.2.13 Routeing would need to consider bird flight paths associated with the Breckland network of sites. Recognised mitigation measures for AC OHL impacts to bird assemblages would need to be used wherever appropriate. Mitigation for impacts of AC OHL connections on bird populations are available, such as bird diverters, but no methods exist that eliminate the potential for collision and avoidance behaviour, or displacement of bird populations. Recommended measures for mitigating for bird collision and mortality from AC OHL prioritise eliminating exposure by undergrounding sections where there is a greater risk or routeing the AC OHL away from important bird areas. Secondary measures for reducing likely impacts to birds from AC OHL include installing bird diverters and embedding measures into the design (e.g., insulated components, greater air space between lines).

8.2.14 The potential for a likely significant effect on these sites would need to be considered in relation to the Conservation of Habitats and Species Regulations 2017.

Physical environment

8.2.15 Any AC OAC route between Necton and Twinstead would have to cross over several unavoidable watercourses and associated flood zones. Given the extent of Flood Zones 2 & 3, across the entire study area, it is likely that a significant amount of development would be located within the floodplain. As flood water can ingress around pylon footprints this is unlikely to result in a significant effect once operational, however temporary impacts could arise where construction works are located within these zones.

8.2.16 Crossings of main rivers, Flood Zone 2 or 3 and Source Protection Zone 3 are likely to be unavoidable.

8.2.17 Significant operational effects are unlikely however a principal consideration is the management of construction works within Flood Zones 2 and 3.

8.3 Socio-economic appraisal

Settlements and populations

8.3.1 There are five main settlements within this study area and smaller settlements scattered throughout. Population density increases towards the south.

8.3.2 The south of the study area is more densely populated with multiple settlements which could impact on the ability to route an AC OHL in this area without multiple angles.

8.3.3 Temporary adverse impacts could arise if the AC OHL is situated within close proximity to settlements during construction associated with noise, air quality and construction traffic. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal.

8.3.4 Standard best practice guidelines should be followed to reduce potential noise and air quality effects during construction. Control measures should be put in place to potential impacts associated with construction traffic.

Tourism and recreation

8.3.5 There are a number of NCNs routes and unnamed routes within this study area. It is considered at least four NCN's are unavoidable. One section of the Peddar's Way and Norfolk Coast Path National Trail runs through the study area. There are three Country Parks within the study area. Knettishall Heath and Nowton Park lie centrally, with Great Conard to the south of the study area.

8.3.6 There is the potential for temporary adverse effects associated with severance should cycle routes or national trails need to be temporarily closed during construction. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal on users of NCN and national trail.

8.3.7 Standard best practice guidelines should be followed to provide appropriate signage, diversion routes and notice for the users of the cycle route and national trails should part of a cycle route or national trail be closed during construction.

Land use

8.3.8 There is no Grade 1 BMV land within this study area. Grade 2 BMV land is located in fragmented sections throughout the study area, although is more prominent in the south, particularly along the western and southern border. Grade 3 BMV agricultural land is the most prominent land type classification. Loss of BMV likely to be limited for the OHL route.

8.3.9 There is the potential for temporary adverse impacts on agricultural land during construction. There is the potential for permanent loss associated with pylon footprints but this is unlikely to be significant. Other land uses are likely to be avoidable.

8.3.10 Standard best practice guidelines should be followed to reinstate agricultural land following construction.

8.3.11 Golf courses, Countryside Rights of Way Access Land Parcels and Forest and Country Parks should be avoided by routeing where possible.

Infrastructure

8.3.12 There are no motorways within this study area. Three trunk roads are located within this study area. The A47 is located in the northwestern corner extending north of Necton substation and is therefore considered avoidable. The A11 extends across the middle of the study in the north between Thetford in the west and Attleborough in the east. The A14 also extends across the middle of the study area in the south between Bury St Edmunds in the west and Haughley in the east. The A14 and A11 are unavoidable within this this study area.

8.3.13 There are a number of railway lines running through the study area. There are four railway lines within this study area, one extends diagonally across the northeast corner between Dereham and Thuxton, one is located in the south and connects into Sudbury from Bures at the southern border and two railway lines extend across the middle of the study area from west to east (between Thetford and Attleborough and between Bury St Edmunds and Haughley). It is considered at least two railway lines are unavoidable.

8.3.14 There are four aerodromes located within this study area. Honington Airfield is located in the north. Wattisham Airfield and two unnamed airfields (located at Felsham and Bury St Edmunds) are located in the south. There are no ports and harbours within this study area. It is considered Woodbridge Airfield is easily avoidable.

8.3.15 Where crossings of other infrastructure is required, there is the potential for temporary closure of roads during construction. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal on users of roads and railways.

8.3.16 Standard best practice guidelines should be followed to provide appropriate signage, diversion routes and notice to the public who use the roads should these be temporary closed during construction.

8.3.17 The route would have to pass over gas transmission pipelines, these areas could require additional cathodic protection methods.

8.3.18 Routeing of a new AC OHL would have to take account of the four aerodromes located within this study area. Potential requirement for routeing away from exclusion zones and aviation warning lighting on the top of the transmission towers if their location is considered a significant navigational hazard.

8.4 Technical scope and costs

8.4.1 Technical analysis of option EAN 2 is as follows:

- This option to connect a 90km circuit between Necton and the proposed new substation at Twinstead, takes energy west to location of a new substation at Twinstead
- Currently the proposed Twinstead Substation is a small connection of demand connection to the local Distribution Network Operator. This site is not sufficient for the connection of new circuits, so a new larger site would need to be established to facilitate the connection of multiple circuits, the number of which will depend upon the combination of options selected to satisfy the needs case set out in this report.

8.4.2 We undertake a cost evaluation of the following four technologies for onshore options evaluation.

a) 400 kV alternating current (AC) overhead line

b) 400 kV AC underground cable

c) 400 kV AC gas insulated line (GIL)

d) 525 kV high voltage direct current (HVDC) underground cable and converter stations

8.4.3 Option EAN 2 requires the following transmission works to satisfy the requirements of the SQSS.

- **New circuit requirements**
  - AC connections options use hi-capacity double circuits (two 400 kV AC circuits) with a total capacity of up to 6930 mega volt amperes (MVA) or;
  - HVDC using 525 kV 2000 MW voltage source links, which would require a convertor station at each end similar in size to a large warehouse. A 6000 MW connection would require three convertor stations at each end, six overall, this is to come close to matching the AC hi-capacity circuits of 6930 MVA.
  - The original assessment minimum HVDC requirement to connect contracted generation, with no ability to accommodate future applications is 4000 MW capability requiring two convertor stations at each end, four overall, this cost is included in brackets () in the table.
- **Substation works**
  - Extension to Necton 400kV Substation by 2 bays to accommodate new circuits.
  - New Twinstead 400kV substation able to accommodate 14 bays (22 bays if option chosen in combination with non Twinstead EAS option)

Table 8.1 – below sets out the capital costs for option EAN 2 considering substation works and each technology option.

Item	**Need**	**EAN 2 Capital Cost**			
Substation Works	Facilitate generation and connect new circuits		£136.0m		
New Circuits		**AC OHL**	**AC Cable**	**AC GIL**	**HVDC (Min 4000 MW rating)**
New Circuit 90 km	New Circuit across EC5 North	£358.2m	£3,873.6m	£3,893.4m	£2,437.4m (£1,625.0m)
Total Capital Cost		**£494.2m**	**£4,009.6m**	**£4,029.4m**	**£2,573.4m (£1,761.0m)**

8.4.4 Table 8.2 below sets out the Circuit Lifetime Cost for the new circuit options, the Circuit Lifetime Costs are different for each circuit technology and are included as a differentiator between technologies. These costs are calculated using the methodology described in Appendix D.

Table 8.2 – EAN 2 Circuit Lifetime Cost Summary

Land Based option	**EAN 2 AC OHL**	**EAN 2 AC Cable**	**EAN 2 AC GIL**	**EAN 2 HVDC (Min 4000 MW rating)**
Capital Cost of New Circuits	£358.2m	£3,873.6m	£3,893.4m	£2,437.4m (£1,625.0m)
NPV of cost of losses over 40 years	£252.5m	£188.4m	£117.2m	£471.2m (£314.1m)
NPV of operation & maintenance costs over 40 years	£5.3m	£18.2m	£5.3m	£172.2m (£114.8m)
Circuit Lifetime Cost of new circuits	**£616m**	**£4,080m**	**£4,016m**	**£3,081m (£2,054m)**

8.4.5 The environmental and technical appraisal considered, alongside capital and Circuit Lifetime Costs, the preferred option for EAN 2, 90 km connection between a Necton and New Twinstead 400kV substations would be for an AC circuit connection. In light of this analysis, our starting presumption for further development of this option should it be selected, would be for a majority overhead line connection.

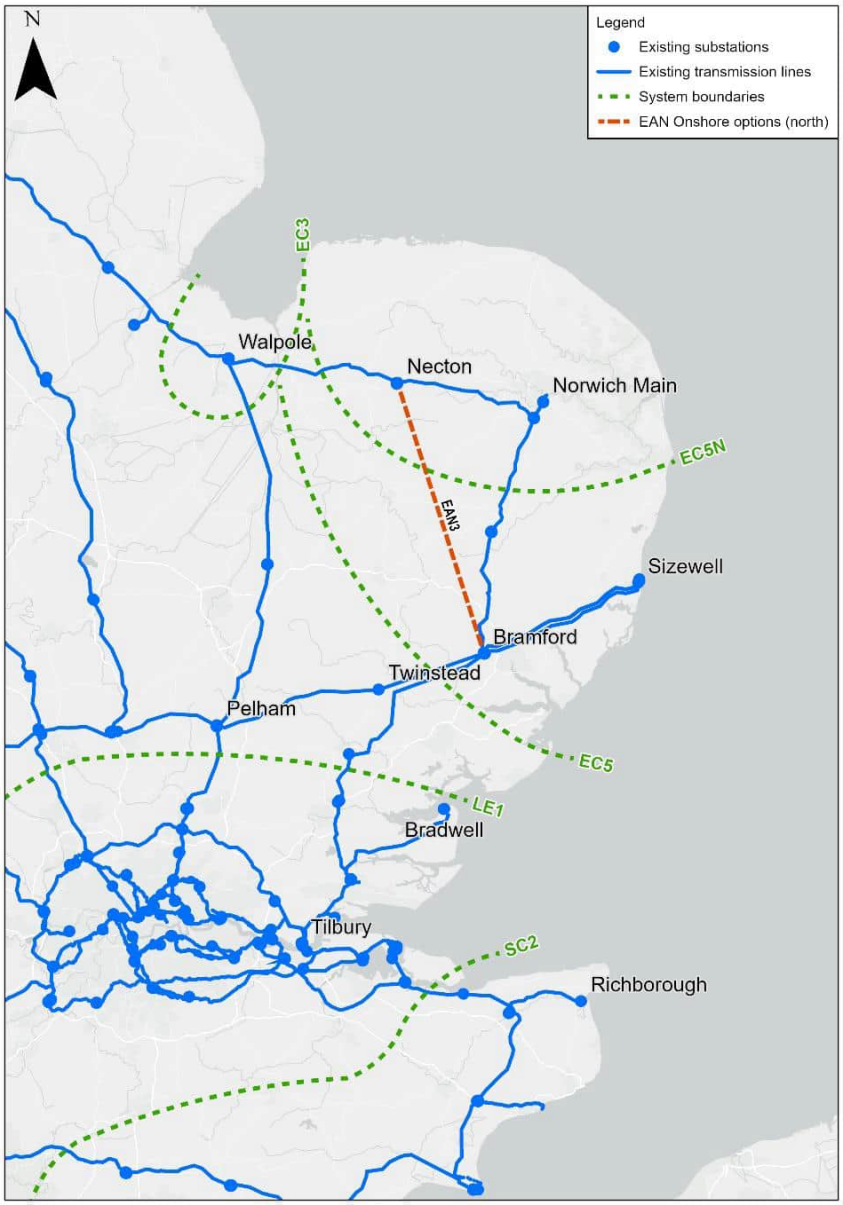
9. EAN3 – Necton to Bramford

9.1 Introduction

9.1.1 Strategic option (SO) EAN 3 involves a new 400kV transmission connection between existing Necton substation and the existing Bramford substation, a distance of approximately 85 km. shown in Figure 9.1. The existing Bramford substation would require modification to accommodate additional circuits, which would be subject to further design and resilience considerations.

9.1.2 With the majority of proposed generation connections to be made between Norwich Main and Necton, this connection not only provides capacity for contracted connections but would accommodate future connections by having additional capacity available.

Figure 9.1 – Option EAN 3 Necton to Bramford



9.2 Environmental appraisal

Landscape and visual

9.2.1 Much of the study area comprises relatively limited constraints to AC OHL which can be addressed by conventional approaches. The eastern central part of the study area around Thetford has a cluster of sensitive receptors which could be avoided if routeing west.

9.2.2 Whilst it should be possible with this option to avoid a good proportion of potential other adverse effects on the landscape and visual amenity, some significant residual effects are possible for residents along affected settlement edges and scattered properties through the introduction of a new AC OHL.

9.2.3 This option is moderately constrained, with a number of opportunities to avoid constraints and for mitigation through more detailed assessment, siting and installation which would reduce potential for significant landscape and visual effects, but a number of adverse effects may remain.

9.2.4 There may be opportunity for paralleling existing OHLs to reduce the spread of infrastructure in the south of the study area.

Historic environment

9.2.5 The scheduled monuments are distributed throughout the study area and include sites dating from the prehistoric period onwards. While examples of scheduled monuments have been recorded throughout the study area, there are several areas where large concentrations of sites have been recorded. These include a number of medieval sites near Castle Acre at the northwest limits of the study area, Roman and medieval sites to the north of Watton, and a number of sites between Thetford and Attleborough including two linear earthworks. Larger scheduled monuments in the southern half of the study area include Baylham Roman Site near Needham Market, although smaller assets are located throughout the southern half of the study area including a number of moated sites.

9.2.6 Listed buildings have been recorded throughout the study area, with the vast majority being Grade II listed. Although a relatively large number of Grade I and II* buildings have been recorded the main focus of these are the settlements scattered throughout the study area, although Grade II listed buildings have also been recorded throughout the landscape.

9.2.7 A number of RPGs have also been recorded throughout the study area. These include Grade I, II*, and II designations and are again distributed throughout the study area, although significant concentrations include the western side of the study area between Castle Acre and Thetford. Two Grade I listed parks and gardens also fall within the southeast corner of the study area near Needham Market.

9.2.8 Although a review of non-designated assets was not undertaken as part of this options appraisal, the Defence of Britain data set was examined and a large number of assets were recorded in the study area. These include a large concentration of defensive structures following the A1088 between Thetford and Elmswell, and this grouping formed part of a ‘Stop Line’ constructed during the Second World War.

9.2.9 It is likely that designated assets, such as scheduled monuments and listed buildings would be avoidable. Physical impacts are likely to be limited to non-designated assets and previously unrecorded assets, although these were not assessed as part of this options appraisal.

9.2.10 There is the potential for significant impacts on the setting, of high value designated assets identified throughout the corridor. This includes the parks and gardens in the northwestern section of the study area, the two parks and gardens near Needham Market, as well as the scheduled monuments and listed buildings throughout the study area.

9.2.11 Mitigation would be required and could include a phased programme of works including geophysical survey, archaeological evaluation trenching, and full archaeological excavation to mitigate physical impacts. The design of any above ground infrastructure required, as well as screening/planting, could potentially mitigate impacts on the setting of designated assets.

Ecology

9.2.12 Statutory designated sites for nature conservation are likely to be avoidable within this study area.

9.2.13 A principal consideration is the Breckland SPA/SAC/SSSI complex which is located within the northwest of the study area. Whilst this site is avoidable there is the potential for impacts on the interest features associated with both habitats and species for which the sites are designated both during construction and operation. Routeing would therefore need to consider bird flight paths. There is the potential that a new AC OHL could introduce a collision risk, avoidance, and disruption of flight paths, and/or mortality sources of impact for a number of bird species. Recommended measures for mitigating for bird collision and mortality from AC OHL prioritise eliminating exposure by undergrounding sections where there is a greater risk or routeing the AC OHL away from important bird areas. Secondary measures for reducing likely impacts to birds from AC OHL include installing bird diverters and embedding measures into the design (e.g., insulated components, greater air space between lines).

9.2.14 The potential for a likely significant effect on these sites would need to be considered in relation to the Conservation of Habitats and Species Regulations 2017.

Physical environment

9.2.15 Any AC OAC route between Necton and Bramford substations would have to cross over several unavoidable watercourses and associated flood zones. Given the extent of Flood Zones 2 & 3, across the entire study area, it is likely that a significant amount of development would be located within the floodplain. As flood water can ingress around pylon footprints this is unlikely to result in a significant effect once operational, however temporary impacts could arise where construction works are located within these zones.

9.2.16 Crossings of main rivers, Flood Zone 2 or 3 and Source Protection Zone 3 are likely to be unavoidable.

9.2.17 Significant operational effects are unlikely however a principal consideration is the management of construction works within Flood Zones 2 and 3.

9.3 Socio-economic appraisal

Settlements and populations

9.3.1 There are five main settlements within this study area and smaller settlements scattered throughout. Population density increases towards the south.

9.3.2 The south of the study area is more densely populated with multiple settlements which could impact on the ability to route an AC OHL in this area without multiple angles.

9.3.3 Temporary adverse impacts could arise if the AC OHL is situated within close proximity to settlements during construction associated with noise, air quality and construction traffic. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal.

9.3.4 Standard best practice guidelines should be followed to reduce potential noise and air quality effects during construction. Control measures should be put in place to potential impacts associated with construction traffic.

Tourism and recreation

9.3.5 There are a number of NCN routes and unnamed routes running through the study area. A national trail runs north to south in the northern half of the study area. There are two Country Parks within the study area. Knettishall Heath near Thetford and Orwell within Ipswich.

9.3.6 There is the potential for temporary adverse effects associated with severance should cycle routes or national trails need to be temporarily closed during construction, however this is likely to be the case with any option, and effects would be temporary. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal on users of NCN and national trail and these effects would be permanent.

9.3.7 Standard best practice guidelines should be followed to provide appropriate signage, diversion routes and notice for the users of the cycle route and national trails should part of a cycle route or national trail be closed during construction.

Land use

9.3.8 Known BMV land (Grade 1 and 2) is present in the study area with the majority being Grade 3 BMV land. A small area of Grade 1 BMV land is located near the southern boundary, this is considered avoidable. Grade 2 is scattered throughout this study area and is considered unavoidable. Loss of BMV likely to be limited for the AC OHL route.

9.3.9 There is the potential for temporary adverse impacts on agricultural land during construction. There is the potential for permanent loss associated with pylon footprints but this is unlikely to be significant. Other land uses are likely to be avoidable.

9.3.10 Standard best practice guidelines should be followed to reinstate agricultural land following construction.

9.3.11 Golf courses, Countryside Rights of Way Access Land Parcels and Forest and Country Parks should be avoided by routeing where possible.

Infrastructure

9.3.12 There are four trunk roads within this study area, including the A14, A12, A11 and A47. The A47 is located north of Necton Substation, A12 is located south of Bramford Substation. The A47 and A12 would not be affected. The A11 and A14 are unavoidable.

9.3.13 There are railway lines running through the study area. At least two railway lines would be unavoidable within this option.

9.3.14 Ipswich Wet Dock and Cliff Quay Port are located at Ipswich. There are nine airports including Honnignton Airfield, Crowfield Airfield, Wattisham Airfield, Elmsett Airfield and five unnamed airports. It is considered the airports and ports are avoidable.

9.3.15 Where crossings of other infrastructure is required, there is the potential for temporary closure of roads during construction. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal on users of roads and railways.

9.3.16 Standard best practice guidelines should be followed to provide appropriate signage, diversion routes and notice to the public who use the roads should these be temporary closed during construction.

9.3.17 The route would have to pass over gas transmission pipelines, these areas could require additional cathodic protection methods.

9.3.18 Routeing of a new AC OHL would have to take account of the nine aerodromes located within this study area. Potential requirement for routeing away from exclusion zones and aviation warning lighting on the top of the transmission towers if their location is considered a significant navigational hazard.

9.4 Technical scope and costs

9.4.1 Technical analysis of option EAN 3 is as follows:

- This option to connect a 85km circuit between Necton and Bramford, takes energy South to the existing Bramford substation.
- The existing Bramford substation would require modification to accommodate additional circuits, which will be subject to further design and resilience considerations.

9.4.2 We undertake a cost evaluation of the following four technologies for onshore options evaluation.

a) 400 kV alternating current (AC) overhead line

b) 400 kV AC underground cable

c) 400 kV AC gas insulated line (GIL)

d) 525 kV high voltage direct current (HVDC) underground cable and converter stations

9.4.3 Option EAN 3 requires the following transmission works to satisfy the requirements of the SQSS.

- **New circuit requirements**
  - AC connections options use hi-capacity double circuits (two 400 kV AC circuits) with a total capacity of up to 6930 mega volt amperes (MVA) or;

- HVDC using 525 kV 2000 MW voltage source links, which would require a convertor station at each end similar in size to a large warehouse. A 6000 MW connection would require three convertor stations at each end, six overall, this is to come close to matching the AC hi-capacity circuits of 6930 MVA.
- The original assessment minimum HVDC requirement to connect contracted generation, with no ability to accommodate future applications is 4000 MW capability requiring two convertor stations at each end, four overall, this cost is included in brackets () in the table.

- **Substation works**
  - Extension to Necton 400kV Substation by 2 bays to accommodate new circuits.
  - Extension to Bramford substation by 2 bays to accommodate new circuits.

Table 9.1 – below sets out the capital costs for option EAN 3 considering substation works and each technology option.

Item	**Need**	**EAN 3 Capital Cost**			
Substation Works	Facilitate generation and connect new circuits	£36.8m			
New Circuits		**AC OHL**	**AC Cable**	**AC GIL**	**HVDC (Min 4000 MW rating)**
New Circuit 85 km	New Circuit across EC5 North	£338.3m	£3,638.2m	£3,677.1m	£2,391.1m (£1,594.1m)
Total Capital Cost		**£375.1**	**£3,675.0m**	**£3,713.9m**	**£2,427.9m (£1,630.9m)**

9.4.4 Table 9.2 below sets out the Circuit Lifetime Cost for the new circuit options, the Circuit Lifetime Costs are different for each circuit technology and are included as a differentiator between technologies. These costs are calculated using the methodology described in Appendix D.

Table 9.2 – EAN 3 Circuit Lifetime Cost Summary

Land Based option	EAN 3 AC OHL	EAN 3 AC Cable	EAN 3 AC GIL	EAN 3 HVDC (Min 4000 MW rating)
Capital Cost of New Circuits	£338.3m	£3,638.2m	£3,677.1m	£2,391.1m (£1,594.1m)
NPV of cost of losses over 40 years	£238.4m	£174.9m	£110.7m	£471.2m (£314.1m)
NPV of operation & maintenance costs over 40 years	£5.0m	£16.4m	£5.0m	£172.1m (£114.7m)
Circuit Lifetime Cost of new circuits	**£582m**	**£3,829m**	**£3,793m**	**£3,034m (£2,023m)**

9.4.5 From the environmental and technical appraisal considered, alongside capital and Circuit Lifetime Costs, the preferred option for EAN 3, 85 km connection between a Necton and Bramford 400kV substations would be for an AC circuit connection. In light of this analysis, our starting presumption for further development of this option should it be selected, would be for a majority overhead line connection.

10. EAN4 – Norwich Main to Bramford

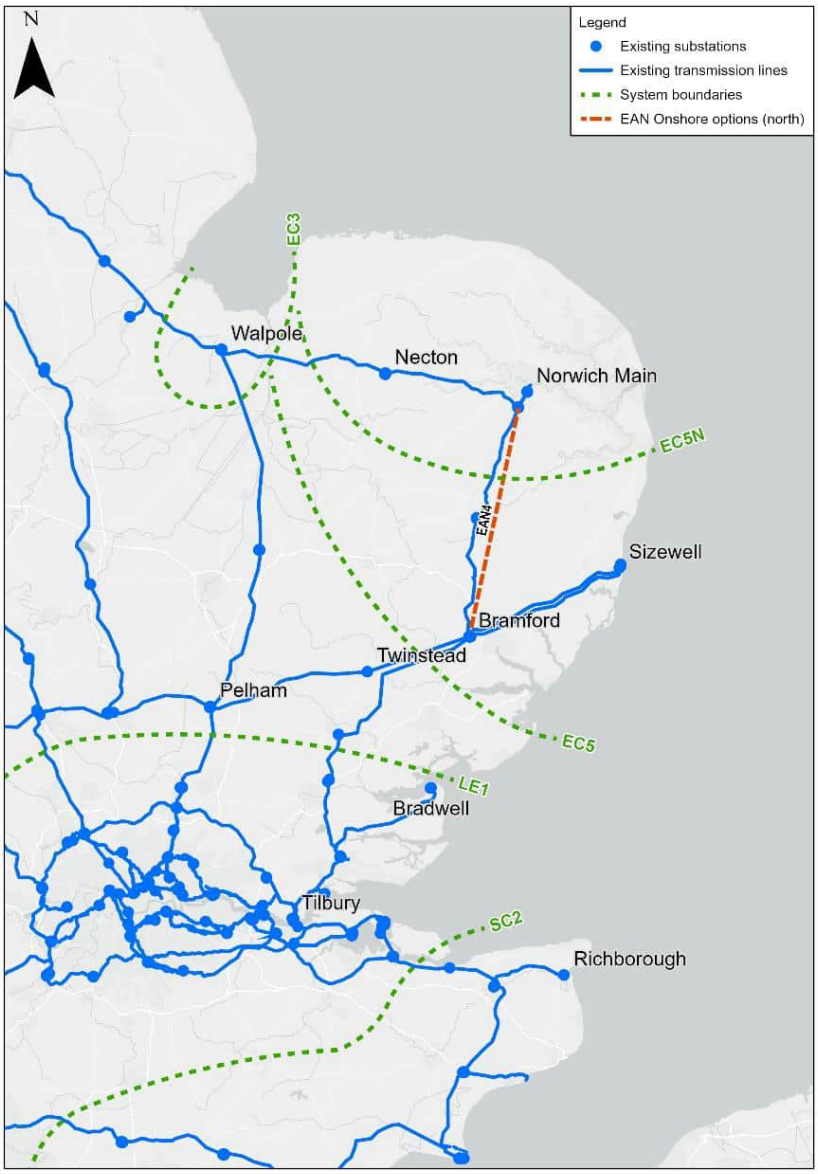
10.1 Introduction

10.1.1 Strategic option (SO) EAN 4 involves a new 400kV transmission connection between the existing Norwich Main substation and the existing Bramford substation, a distance of approximately 80 km. This is shown in Figure 10.1 below.

10.1.2 The existing Bramford substation would require modification to accommodate additional circuits, which would be subject to further design and resilience considerations.

10.1.3 With the majority of proposed generation connections to be made between Norwich and Necton, this connection not only provides capacity for contracted connections but would accommodate future connections by having additional capacity available.

Figure 10.1 – Option EAN 4 Norwich Main to Bramford



10.2 Environmental appraisal

Landscape and visual

10.2.1 Much of the study area comprises relatively limited constraints to an AC OHL which can be addressed by conventional approaches e.g., routeing. Whilst it should be possible with this option to avoid a good proportion of potential adverse effects on the landscape and visual amenity; some significant residual effects are possible for residents along affected settlement edges and scattered properties, particularly if there are islanding of properties between the two OHLs; existing and proposed.

10.2.2 This option has few constraints. Some opportunities exist for mitigation through more detailed assessment, siting, routeing and construction which would reduce the potential for some visual effects. Some limited significant residual visual effects are possible.

10.2.3 There may be opportunity for paralleling the existing OHL throughout this study area to reduce the spread of infrastructure. In some locations it may be challenging to identify a parallel alignment due to settlement and other land uses.

Historic environment

10.2.4 Designated sites are distributed throughout the study area, although a number are located at the southern end of the option near Needham Market, including Shrubland Hall Grade I Registered Park and Garden, and Baylham Roman site which is a scheduled monument and lies adjacent to the Shrubland. Other scheduled monuments have also been recorded throughout the study area, although concentrations have been recorded within central sections of the study area. A large scheduled area also exists to the south of Norwich, at the northern end of the study area. The latter site includes a large multi-period site located less than 800m northeast of Norwich substation, and the existing OHL running north from the substation passes this scheduled monument.

10.2.5 The majority of listed buildings are focused on settlements, with concentrations in towns and villages such as Diss, Stowmarket, and Needham Market, as well as Ipswich.

10.2.6 Only a limited number of military remains have been recorded through the option, and most of these are near the settlements of Diss and Ipswich. Other non-designated assets have not been considered as part of the current assessment.

10.2.7 It is likely that designated assets, such as scheduled monuments and listed buildings would be avoided. Physical impacts are likely to be limited to non-designated assets and previously unrecorded assets, although these were not assessed as part of this options appraisal.

10.2.8 There is the potential for significant impacts on the setting, with many high value designated assets identified throughout the corridor. It must also be considered that further above ground infrastructure on the south side of Norwich, where a number of scheduled monuments are recorded, could result in a cumulative impact on these receptors.

10.2.9 Mitigation would be required and could include a phased programme of works including geophysical survey, archaeological evaluation trenching, and full archaeological excavation to mitigate physical impacts. The design of any above ground infrastructure required, as well as screening/planting, could potentially mitigate impacts on the setting of designated assets.

Ecology

10.2.10 There is one site subject to a European designation within the study area (Norfolk Valley Fens SAC), this is located in the far north of the study area to the northwest of Norwich and is unlikely to be affected.

Physical environment

10.2.11 Any AC OAC route between Norwich Main and Bramford substations would have to cross over several unavoidable watercourses and associated flood zones. Given the extent of Flood Zones 2 & 3, across the entire study area, it is likely that a significant amount of development would be located within the floodplain. As flood water can ingress around pylon footprints this is unlikely to result in a significant effect once operational, however temporary impacts could arise where construction works are located within these zones.

10.2.12 Crossings of main rivers, Flood Zone 2 or 3 and Source Protection Zone 3 are likely to be unavoidable.

10.2.13 Significant operational effects are unlikely however a principal consideration is the management of construction works within Flood Zones 2 and 3.

10.3 Socio-economic appraisal

Settlements and populations

10.3.1 There are three main settlements boundaries including Ipswich, Stowmarket and Wymondham within this study area. Population density is greater in the south.

10.3.2 Temporary adverse impacts could arise if the AC OHL is situated within close proximity to settlements during construction associated with noise, air quality and construction traffic. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal.

Tourism and recreation

10.3.3 There are a number of unnamed NCN routes that run through the study area. NCNs extend across the middle of the study area and are prominent in the south, particularly at Ipswich.

10.3.4 There is the potential for temporary adverse effects associated with severance should cycle routes need to be temporarily closed during construction. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal on users of NCN.

10.3.5 Standard best practice guidelines should be followed to provide appropriate signage, diversion routes and notice for the users of the cycle route should part of a cycle route be closed during construction.

Land use

10.3.6 There are no areas of Grade 1 BMV land. Grade 2 BMV land occurs in fragmented areas throughout, however, is more prominent in south. Grade 3 BMV agricultural land

is the most prominent land type classification. Loss of BMV likely to be limited for the AC OHL route.

10.3.7 There is the potential for temporary adverse impacts on agricultural land during construction. There is the potential for permanent loss associated with pylon footprints but this is unlikely to be significant. Other land uses are likely to be avoidable.

10.3.8 Standard best practice guidelines should be followed to reinstate agricultural land following construction.

10.3.9 Golf courses and other land uses should be avoided by routeing where possible.

Infrastructure

10.3.10 There are no motorways within this study area. The A47 and A11 are located in the northwest corner of the study area and are avoidable. The A14 is located across the southwest corner of the study area and is unavoidable.

10.3.11 There are a number of railway lines that run through the study area. There are five railway lines within this study area. One railway line extends across the northwest corner of the study area. A railway line extends from Norwich through the middle of the study area to Ipswich via Haughley (located near the western border in the south). Three further railway lines are located in Ipswich. It is considered at least one railway line is unavoidable.

10.3.12 Ipswich Wet Dock is located in Ipswich. Three aerodromes are located in the south of this study area including Crowfield Airfield, Elmsett Aerodrome and Wattisham Airfield is considered the airports and ports are avoidable.

10.3.13 Where crossings are required, there is the potential for temporary closure of roads during construction. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal on users of roads and railways.

10.3.14 Standard best practice guidelines should be followed to provide appropriate signage, diversion routes and notice to the public who use the roads should these be temporarily closed during construction.

10.3.15 The route would have to pass over gas transmission pipelines, these areas could require additional cathodic protection methods.

10.3.16 Routeing of a new AC OHL would have to take account of the three aerodromes located within this study area. Potential requirement for routeing away from exclusion zones and aviation warning lighting on the top of the transmission towers if their location is considered a significant navigational hazard.

10.4 Technical scope and costs

10.4.1 Technical analysis of option EAN 4 is as follows:

- This option to connect a 80km circuit between Norwich and Bramford, takes energy South to the existing Bramford substation.
- The existing Bramford substation would require modification to accommodate additional circuits, which will be subject to further design and resilience considerations.

10.4.2 With the majority of proposed generation connections to be made between Norwich and Necton, this connection not only provides capacity for contracted connections but will accommodate future connections by having additional capacity available.

10.4.3 We undertake a cost evaluation of the following four technologies for onshore options evaluation.

a) 400 kV alternating current (AC) overhead line

b) 400 kV AC underground cable

c) 400 kV AC gas insulated line (GIL)

d) 525 kV high voltage direct current (HVDC) underground cable and converter stations

10.4.4 Option EAN 4 requires the following transmission works to satisfy the requirements of the SQSS.

- **New circuit requirements**
  - AC connections options use hi-capacity double circuits (two 400 kV AC circuits) with a total capacity of up to 6930 mega volt amperes (MVA) or;
  - HVDC using 525 kV 2000 MW voltage source links, which would require a convertor station at each end similar in size to a large warehouse. A 6000 MW connection would require three convertor stations at each end, six overall, this is to come close to matching the AC hi-capacity circuits of 6930 MVA.
  - The original assessment minimum HVDC requirement to connect contracted generation, with no ability to accommodate future applications is 4000 MW capability requiring two convertor stations at each end, four overall, this cost is included in brackets () in the table.
- **Substation works**
  - Extension to Norwich 400kV Substation by 2 bays to accommodate new circuits.
  - Extension to Bramford substation by 2 bays to accommodate new circuits.

Table 10.1 – below sets out the capital costs for option EAN 4 considering substation works and each technology option.

Item	**Need**	**EAN 4 Capital Cost**			
Substation Works	Facilitate generation and connect new circuits		£36.8m		
New Circuits		**AC OHL**	**AC Cable**	**AC GIL**	**HVDC (Min 4000 MW rating)**
New Circuit 80 km	New Circuit across EC5 North	£318.4m	£3,421.3m	£3,460.8m	£2,344.7m (£1,594.1m)

Item	Need	EAN 4 Capital Cost			
Total Capital Cost		**£355.2m**	**£3,458.1m**	**£3,497.6m**	**£2,381.5m (£1,630.9m)**

10.4.5 Table 10.2 below sets out the Circuit Lifetime Cost for the new circuit options, the Circuit Lifetime Costs are different for each circuit technology and are included as a differentiator between technologies. These costs are calculated using the methodology described in Appendix D.

Table 10.2 – EAN 4 Circuit Lifetime Cost Summary

Land Based option	EAN 4 AC OHL	EAN 4 AC Cable	EAN 4 AC GIL	EAN 4 HVDC (Min 4000 MW rating)
Capital Cost of New Circuits	£318.4m	£3,421.3m	£3,460.8m	£2,344.7m (£1,563.2m)
NPV of cost of losses over 40 years	£224.4m	£161.3m	£104.2m	£471.2m (£314.1m)
NPV of operation & maintenance costs over 40 years	£4.7m	£15.5m	£4.7m	£172.1m (£114.7m)
Circuit Lifetime Cost of new circuits	**£548m**	**£3,598m**	**£3,570m**	**£2,988m (£1,992m)**

10.4.6 From the environmental and technical appraisal considered, alongside capital and Circuit Lifetime Costs, the preferred option for EAN 4, 80 km connection between a Norwich and Bramford 400kV substations would be for an AC circuit connection. In light of this analysis, our starting presumption for further development of this option should it be selected, would be for a majority overhead line connection.

11. EAS1 – Twinstead to Tilbury

11.1 Introduction

11.1.1 Strategic option (SO) EAS 1 involves a new 400kV transmission connection between the new substation at Twinstead and the existing Tilbury substation, a distance of approximately 80 km. shown in Figure 11.1. Twinstead substation would require a complete redesign from current proposals as described below.

11.1.2 Currently the proposed Twinstead substation is a small connection of demand connection to the local Distribution Network Operator. This site is not sufficient for the connection of new circuits, so a new larger site would need to be established to facilitate the connection of multiple circuits.

11.1.3 If this option were to be selected in combination with northern options connecting to Pelham (EAN1) or Bramford (EAN3 and EAN4), all 4 circuits travelling east from Bramford would need to be turned into the new Twinstead substation.

11.1.4 This option would facilitate the connection of the contracted Essex Cost Generation Group including Tarchon Interconnector, North Falls and Five Estuary offshore wind generation, if connection were made at the new Twinstead substation.

Figure 11.1 – Option EAS 1 Twinstead to Tilbury



11.2 Environmental appraisal

Landscape and visual

11.2.1 One nationally designated landscape, the Dedham Vale AONB, is present in the study area. However, due the location of the AONB in the northeastern corner of the study area, it is assumed that it would be avoided and therefore is not considered a particular constraint to the option.

11.2.2 Paralleling the exiting line from Twinstead would be challenging due to its alignment and the potential to island properties between the existing and proposed OHL.

11.2.3 This option is moderately to heavily constrained due to areas of denser settlement to the south. Some opportunities exist for mitigation through more detailed assessment, siting, routeing and construction which would reduce the potential for some visual effects, including consideration of the relationship between the option and the existing 400kV OHL. Some significant residual visual effects are possible.

Historic environment

11.2.4 Scheduled monuments are located throughout the study area, although concentrations have been recorded in the southern section towards Canvey Island and Tilbury, as well as in the central area.

11.2.5 Parks and Gardens in the study area are focused on the central and northern sections of the study area, with some of the largest examples flanking the A12 as it passes through the study area, and in the northeast corner near Halstead, although the extensive Thorndon Hall, with its grounds designed by Capability Brown, near the southwest also represents a key designed landscape.

11.2.6 The site of the Battle of Maldon represents the only battlefield in the study area and is located on the eastern limit of the study area near Maldon and the River Blackwater.

11.2.7 Military defences have also been identified throughout the option, with a significant cluster in the northeast corner where the main railway line passes through the option, and in the central area where they flank the A130. This latter cluster forms part of a Second World War ‘stop line’. Other non-designated assets have not been considered as part of the assessment.

Ecology

11.2.8 European and national designated sites are likely to be avoidable.

11.2.9 Whilst sites are avoidable there are number of SPAs on the eastern edge of the study area and Hanningfield Reservoir which are designated for bird populations. Routeing would therefore need to consider bird flight paths. Opportunities may exist to parallel the existing 4VB overhead line, which may reduce potential for collision risk due to bird species being habituated in this area. Although should a new AC OHL parallel the existing OHL within this study area this would require the AC OHL to cross an RSPB reserve to the northeast of Tilbury.

11.2.10 Recognised mitigation measures for AC OHL impacts to bird assemblages would need to be used wherever appropriate. Mitigation for impacts of AC OHL connections on bird populations are available, such as bird diverters, but no methods exist that eliminate the potential for collision and avoidance behaviour, or displacement of bird populations.

Recommended measures for mitigating for bird collision and mortality from AC OHL prioritise eliminating exposure by undergrounding sections where there is a greater risk or routeing the AC OHL away from important bird areas. Secondary measures for reducing likely impacts to birds from AC OHL include installing bird diverters and embedding measures into the design (e.g. insulated components, greater air space between lines).

11.2.11 The potential for a likely significant effect on these sites would need to be considered in relation to the Conservation of Habitats and Species Regulations 2017.

Physical environment

11.2.12 It is likely that a significant amount of development would be located within the floodplain. As flood water can ingress around pylon footprints this is unlikely to result in a significant effect once operational, however temporary impacts could arise where construction works are located within these zones.

11.2.13 Crossings of main rivers, Flood Zones 2 or 3 are unlikely to be avoidable.

11.2.14 Significant operational effects from the AC OHL are unlikely however a principal consideration is the management of construction works within Flood Zones 2 and 3.

11.2.15 Any extension to Tilbury substation would be within Flood Zone 3 therefore additional mitigation measures may be required.

11.3 Socio-economic appraisal

Settlements and populations

11.3.1 There are fifteen main settlements which extend into this study area. Population density is greater in the south. Due to the density of the settlement pattern particularly in the south it is likely that an AC OHL would need to be routed near some settlements.

11.3.2 Temporary adverse impacts could arise if the AC OHL is situated within close proximity to settlements during construction associated with noise, air quality and construction traffic. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal.

Tourism and recreation

11.3.3 There are a number of NCNs routes and unnamed routes that run through the study area. Known NCNs within this study area include Flitch Way, Mardyke Valley Route and the Heron Trail. NCN's are more prominent in the north of this study area. It is considered at least three NCN's are unavoidable.

11.3.4 There are 15 country parks within the study area located predominantly to the south between Chelmsford and Basildon.

11.3.5 There is the potential for temporary adverse effects associated with severance should cycle routes need to be temporarily closed during construction however, this is likely to be the case with any option, and effects would be temporary. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal on users of NCN and these effects would be permanent.

11.3.6 Standard best practice guidelines should be followed to provide appropriate signage, diversion routes and notice for the users of the cycle route should part of a cycle route be closed during construction.

Land use

11.3.7 Grade 1 BMV land is located in the southeast and southwest corner of the study area. Grade 2 BMV land is located in fragmented sections throughout the study area, however, is more prominent along the southern border and in the northwest. Grade 3 BMV agricultural land is the most prominent land type classification in the study area. Loss of BMV is likely to be limited for the AC OHL route.

11.3.8 There is the potential for temporary adverse impacts on agricultural land during construction. There is the potential for permanent loss associated with pylon footprints, but this is unlikely to be significant.

11.3.9 Standard best practice guidelines should be followed to reinstate agricultural land following construction.

11.3.10 There is the potential to oversail a golf course due to the density of the settlement pattern coupled with other constraints. Other land uses should be avoided by routeing where possible.

Infrastructure

11.3.11 The M25 motorway, A13 and A282 is located in the southwest corner of this study area. The A12 extends diagonally across the study area from Ingatestone at the western border in the south to Colchester at the eastern border in the north. The A120 extends across the study area in the north from Rayne in the west to Colchester in the east. It is considered the A120 and A12 are unavoidable.

11.3.12 There are a number of railway lines within this study area. Railway lines connect the urban settlements described above. A number of railway lines extend across the entire reach of the study area and which are therefore unavoidable. This includes a railway line extending diagonally across the study area between Brentwood and Colchester. A railway line extends from Brentwood to Wickford, here two railway lines diverge from Wickford to Hockley and South Woodham Ferrers. A railway line extends between Benfleet in the east to West Horndon in the west. It is considered the AC OHL would need to cross at least three railway lines and possibly more.

11.3.13 Four aerodromes are located within this study area including Essex Air Ambulance Airbase/Earls Colne Airfield, Napps Field, Stow Maries Aerodrome and an unnamed airfield at Great Maplestead in the north. There are four ports and harbours located in the south of this study area including London Cruise Terminal, London Gateway Port, Tilbury Docks and the Town Pier in Tilbury. The locations of airfields and ports/harbours are easily avoidable.

11.3.14 Where crossings are required, there is the potential for temporary closure of roads during construction. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal on users of roads and railways.

11.3.15 Standard best practice guidelines should be followed to provide appropriate signage, diversion routes and notice to the public who use the roads should these be temporary closed during construction.

11.3.16 The route would have to pass over gas transmission pipelines, these areas could require additional cathodic protection methods.

11.3.17 Routeing of a new AC OHL would have to take account of the four aerodromes located within this study area. Potential requirement for routeing away from exclusion zones and aviation warning lighting on the top of the transmission towers if their location is considered a significant navigational hazard.

11.4 Technical scope and costs

11.4.1 Technical analysis of option EAS 1 is as follows:

- This option to connect a 80km circuit between New Twinstead and Tilbury, takes energy south to the existing substation at Tilbury.
- Currently the proposed Twinstead Substation is a small connection of demand connection to the local Distribution Network Operator. This site is not sufficient for the connection of new circuits, so a new larger site would need to be established to facilitate the connection of multiple circuits, generation and interconnectors.
- If this option is selected in combination with EAN option connecting to Bramford and Pelham, then all 4 circuits travelling east from Bramford need to be turned into the new Twinstead substation.
- Additional costs would be incurred to allow this option to facilitate the contracted Essex Cost Generation Group including Tarchon Interconnector, North Falls and Five Estuary offshore wind generation. These would be for a connection at a new Twinstead substation and incremental costs for the generators and interconnector to reach the connection point. This would also increase the cost for any future offshore generation, required to meet the national net zero by 2050 targets, having to connect to the same location.

11.4.2 We undertake a cost evaluation of the following four technologies for onshore options evaluation.

a) 400 kV alternating current (AC) overhead line

b) 400 kV AC underground cable

c) 400 kV AC gas insulated line (GIL)

d) 525 kV high voltage direct current (HVDC) underground cable and converter stations

11.4.3 Option EAS 1 requires the following transmission works to satisfy the requirements of the SQSS.

- **New circuit requirements**
  - AC connections options use hi-capacity double circuits (two 400 kV AC circuits) with a total capacity of up to 6930 mega volt amperes (MVA) or;

- HVDC using 525 kV 2000 MW voltage source links, which would require a convertor station at each end similar in size to a large warehouse. A 6000 MW connection would require three convertor stations at each end, six overall, this is to come close to matching the AC hi-capacity circuits of 6930 MVA.
- The original assessment minimum HVDC requirement to connect contracted generation, with no ability to accommodate future applications is 4000 MW capability requiring two convertor stations at each end, four overall, this cost is included in brackets () in the table.

- **Substation works**
  - New Twinstead 400kV substation able to accommodate 14 bays (22 bays if option chosen in combination with non Twinstead EAS option)
  - Extension to Tilbury 400kV Substation by 2 bays to accommodate new circuits.

Table 11.1 – EAS 1 Capital Cost Summary.

Item	**Need**	**EAS 1 Capital Cost**			
Substation Works	Facilitate generation and connect new circuits	£136.0m			
New Circuits		**AC OHL**	**AC Cable**	**AC GIL**	**HVDC (Min 4000 MW rating)**
New Circuit 80 km	New Circuit across EC5 and LE1	£318.4m	£3,421.3m	£3,460.8m	£2,344.7m (£1,563.2m)
Total Capital Cost		**£454.4m**	**£3,557.3m**	**£3,596.8m**	**£2,480.7m (£1,699.2m)**

11.4.4 Table 11.2 below sets out the Circuit Lifetime Cost for the new circuit options, the Circuit Lifetime Costs are different for each circuit technology and are included as a differentiator between technologies. These costs are calculated using the methodology described in Appendix D.

Table 11.2 – EAS 1 Circuit Lifetime Cost Summary

Land Based option	EAS 1 AC OHL	EAS 1 AC Cable	EAS 1 AC GIL	EAS 1 HVDC (Min 4000 MW rating)
Capital Cost of New Circuits	£318.4m	£3,421.3m	£3,460.8m	£2,344.7m (£1,563.2m)
NPV of cost of losses over 40 years	£224.4m	£161.3m	£104.2m	£471.2m (£314.1m)
NPV of operation & maintenance costs over 40 years	£4.7m	£15.5m	£4.7m	£172.1m (£114.7m)
Circuit Lifetime Cost of new circuits	**£548m**	**£3,598m**	**£3,570m**	**£2,988m (£1,992m)**

11.4.5 From the environmental and technical appraisal considered, alongside capital and Circuit Lifetime Costs, the preferred option for EAS 1, 80 km connection between a New Twinstead and Tilbury 400kV substations would be for an AC circuit connection. In light of this analysis, our starting presumption for further development of this option should it be selected, would be for a majority overhead line connection.

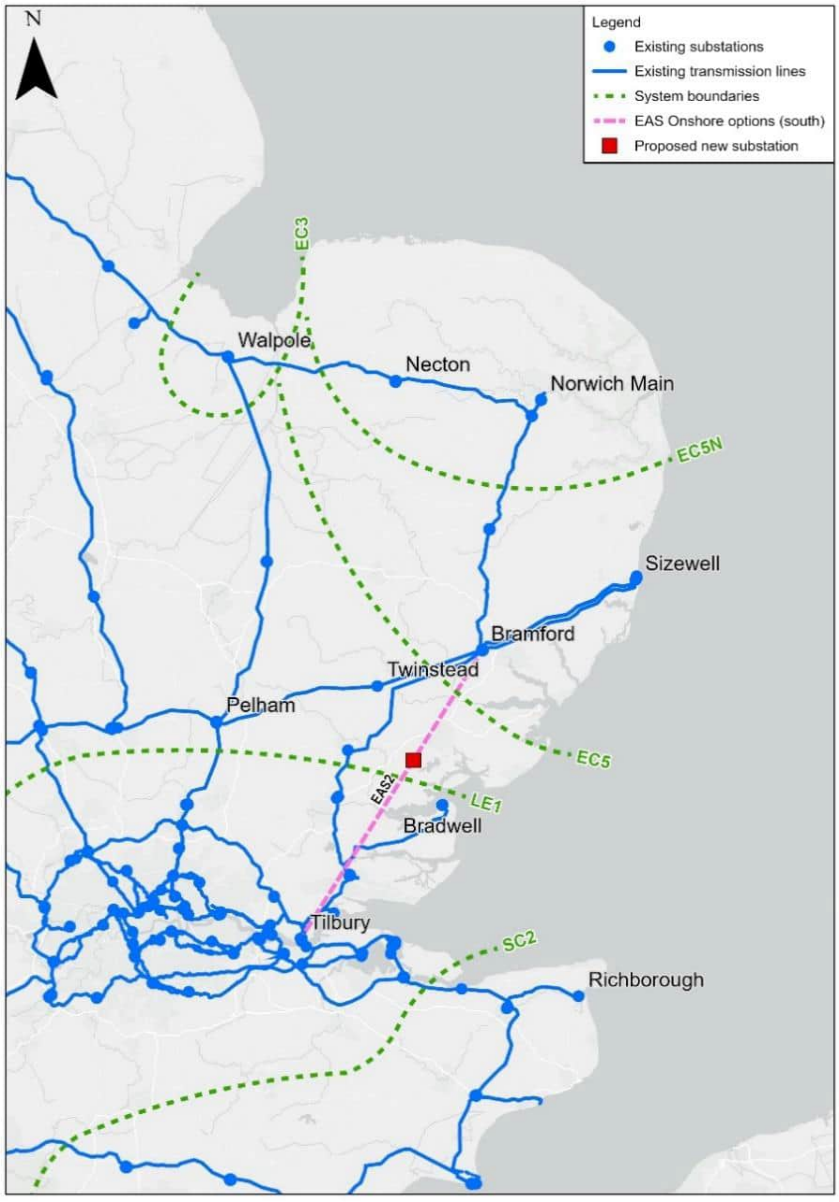
12. EAS2 – Bramford via new substation to Tilbury

12.1 Introduction

12.1.1 Strategic option (SO) EAS 2 involves a new 400kV transmission connection between the existing substation at Bramford via a new substation enroute and the existing Tilbury substation, a distance of approximately 100 km. shown in Figure 12.1.

12.1.2 This option facilitates the contracted Essex Cost Generation Group including Tarchon Interconnector, North Falls and Five Estuary offshore wind generation at their existing contracted point of connection.

Figure 12.1 – Option EAS 2 Bramford via New Substation to Tilbury



12.2 Environmental appraisal

Landscape and visual

12.2.1 Much of the study area comprises constraints to an AC OHL, some of which can be addressed by conventional approaches e.g., routeing/ paralleling. Whilst it should be possible with this option to avoid some potential adverse effects on the landscape and visual amenity of the Dedham Vale AONB and South Suffolk and North Essex Claylands NCA, it is considered unlikely that all of the impacts could easily be mitigated, and significant residual effects are therefore possible. It is also expected that there would be adverse visual effects to residents along affected settlement edges, scattered properties, and visitors to RPGs and Country Parks through increased 'wirescape'.

12.2.2 The Dedham Vale AONB is avoidable within this study area, although to route from Bramford to a new substation on the Tendring Peninsular would require a significantly longer AC OHL route.

12.2.3 A route through the AONB would require at least 5km of undergrounding. Careful route alignment/siting is important to minimise long term effects on characteristic and highly sensitive landcover, such as Ancient Woodland (considered irreplaceable) as a result of installing an underground connection. Trenchless installation techniques or other technology might be required to avoid effects on Ancient Woodland cover.

12.2.4 This option is significantly constrained, however, some opportunities exist for mitigation through more detailed assessment, siting, routeing and construction or installation which would reduce the potential for some significant landscape and visual effects, however there is the potential for residual significant effects.

Historic environment

12.2.5 Parks and Gardens and scheduled monuments are distributed throughout the corridor, although there is a large concentration of scheduled monuments to the south of Colchester, and two scheduled monuments flank the existing Tilbury power station. Two extensive Parks and Gardens (Weald Park and Thorndon Hall) also occupy a large area of land near Brentwood.

12.2.6 Military defences exist throughout the study area, however there are relatively few significant clusters. Small clusters have been recorded along the A20, where the remains of a Second World War 'stop line' can be traced. Other non-designated assets have not been considered as part of the assessment.

12.2.7 It is likely that designated assets, such as scheduled monuments and listed buildings would be avoidable. Physical impacts are likely to be limited to non-designated assets and previously unrecorded assets, although these were not assessed as part of this options appraisal.

12.2.8 There is the potential for significant impacts on the setting of high value designated assets identified throughout the study area. This could include routeing near areas of previous disturbance, as well as limiting above ground infrastructure in areas of high value receptors.

12.2.9 Mitigation would be required and could include a phased programme of works including geophysical survey, archaeological evaluation trenching, and full archaeological excavation to mitigate physical impacts.

12.2.10 The design of any above ground infrastructure required, as well as screening/planting, could potentially mitigate impacts on the setting of designated assets.

Ecology

12.2.11 Whilst European and national designated sites are likely to be avoidable to route from a new substation on the Tendring Peninsular to Tilbury would require the AC OAC to be routed around Colne and Blackwater Estuary which would increase the length of the AC OHL unless a trenchless solution was used to cross this feature and associated designated sites.

12.2.12 Whilst sites are avoidable a large proportion of the study area is designated as SPAs on the eastern edge. Routeing would therefore need to consider bird flight paths. Opportunities may exist to parallel the existing 4VB overhead line, this may reduce potential for collision risk due to bird species being habituated in this area. Should a parallel solution be achievable to minimise potential impacts on species of bird this would require the AC OHL to cross an RSPB reserve to the northeast of Tilbury.

12.2.13 Recognised mitigation measures for AC OHL impacts to bird assemblages would need to be used wherever appropriate. Mitigation for impacts of AC OHL prioritise eliminating exposure by undergrounding sections where there is a greater risk or routeing the AC OHL away from important bird areas. Secondary measures for reducing likely impacts to birds from AC OHL include installing bird diverters and embedding measures into the design (e.g., insulated components, greater air space between lines).

12.2.14 The potential for a likely significant effect on these sites would need to be considered in relation to the Conservation of Habitat and species Regulations 2017.

Physical environment

12.2.15 It is likely that a significant amount of development would be located within the floodplain. As flood water can ingress around pylon footprints this is unlikely to result in a significant effect once operational, however temporary impacts could arise where construction works are located within these zones.

12.2.16 Crossings of main rivers, flood zones 2 or 3 are likely to be unavoidable.

12.2.17 Significant operational effects are unlikely however a principal consideration is the management of construction works within Flood Zones 2 and 3.

12.2.18 The location of the new sub is not yet known but avoidance of Flood Zones 1 and 3 should be achievable on the Tendring Peninsular.

12.2.19 Any extension to Tilbury substation would be within Flood Zone 3 therefore additional mitigation measures may be required.

12.3 Socio-economic appraisal

Settlements and populations

12.3.1 There are 22 main settlements within this study area and population density increases towards the south. Whilst settlements are potentially avoidable, due to the density of the study area in the south it is likely that a new AC OHL would need to be routed near to settlements.

12.3.2 Temporary adverse impacts could arise if the AC OHL is situated within close proximity to settlements during construction associated with noise, air quality and construction traffic. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal.

Tourism and recreation

12.3.3 There are a number of NCNs routes within this study area. It is considered multiple cycle routes would be unavoidable within this option. There are also 27 Country Parks. These are found slightly more to the southern half of the study area with a cluster between Brentwood and Basildon.

12.3.4 There is the potential for temporary adverse effects associated with severance should cycle routes need to be temporarily closed during construction, however this is likely to be the case with any option and effects would be temporary. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal on users of NCN and these effects would be permanent.

12.3.5 Standard best practice guidelines should be followed to provide appropriate signage, diversion routes and notice for the users of the cycle route should part of a cycle route be closed during construction.

Land use

12.3.6 Grade 1 BMV land is located in the east of the study area. Grade 2 BMV land is fragmented throughout this study area. Grade 3 BMV agricultural land is prominent land type classification in the study area. Bramford Substation is located on Grade 2 BMV land. Loss of BMV likely to be limited for the AC OHL route but could be more significant where there are new substations.

12.3.7 There is the potential for temporary adverse impacts on agricultural land during construction. There is the potential for permanent loss associated with pylon footprints but this is unlikely to be significant. Loss of BMV due to the substation should be avoidable. Other land uses are likely to be avoidable.

12.3.8 There is the potential to oversail a golf course due to the location of golf courses in relation to other constraints. Other land uses should be avoided by routeing where possible.

Infrastructure

12.3.9 The M25 motorway, A13 A1089, and A282 are located in the southwest corner of this study area. The A12 extends diagonally across the study area between Ipswich and Brentwood. The A120 extends across the study area in the north between Braintree and Harwich. The A14 extends around the urban settlement of Ipswich. It is considered that the A120 and A12 are unavoidable.

12.3.10 There are railway lines within this study area. Railway lines connect the urban settlements described above. It is considered at least three railway lines, and possibly more would need to be crossed within this option.

12.3.11 Ten aerodromes are located within this study area, including Damyns Hall Aerodrome, Elsett, Essex Air Ambulance Airbase/Earls Colne Airfield, Great Oakley Airfield, London Southend Airfield, Napps Field, Stoke Golding Airfield, Stow Maries Aerodrome, Wattisham Airfield and an unnamed airfield located at Great Wakering. Ten ports and

harbours area located within this study area including Chatham Docks, Cliff Quay, Harwich International Port, Ipswich Wet Dock, London Cruise Terminal, London Gateway Port, London Thamesport, Port of Felixstowe/Freightliner Terminal, Tilbury Docks, Town Pier. The locations of airfields and ports/harbours are considered avoidable.

12.3.12 Where crossings are required, there is the potential for temporary closure of roads during construction. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal on users of roads and railways.

12.3.13 Standard best practice guidelines should be followed to provide appropriate signage, diversion routes and notice to the public who use the roads should these be temporary closed during construction.

12.3.14 The route would have to pass over gas transmission pipelines, these areas could require additional cathodic protection methods.

12.3.15 Routeing of a new AC OHL would have to take account of the ten aerodromes located within this study area. Potential requirement for routeing away from exclusion zones and aviation warning lighting on the top of the transmission towers if their location is considered a significant navigational hazard.

12.4 Technical scope and costs

12.4.1 Technical analysis of option EAS 2 is as follows:

- This option to connect a 100km circuit between Bramford via New Connection Substation and Tilbury, takes energy south via a New Connection Substation to the existing substation at Tilbury.
- This option facilitates the contracted Essex Cost Generation Group including Tarchon Interconnector, North Falls and Five Estuary offshore wind generation at their existing contracted point of connection.

12.4.2 We undertake a cost evaluation of the following four technologies for onshore options evaluation.

a) 400 kV alternating current (AC) overhead line

b) 400 kV AC underground cable

c) 400 kV AC gas insulated line (GIL)

d) 525 kV high voltage direct current (HVDC) underground cable and converter stations

12.4.3 Option EAS 2 requires the following transmission works to satisfy the requirements of the SQSS.

- **New circuit requirements**
  - AC connections options use hi-capacity double circuits (two 400 kV AC circuits) with a total capacity of up to 6930 mega volt amperes (MVA) or;
  - HVDC using 525 kV 2000 MW voltage source links, which would require a convertor station at each end similar in size to a large warehouse. A 6000 MW connection would require three convertor stations at each end, nine overall, this is to come close to matching the AC hi-capacity circuits of 6930 MVA.

- The original assessment minimum HVDC requirement to connect contracted generation, with no ability to accommodate future applications is 4000 MW capability requiring two convertor stations at each end, six overall, this cost is included in brackets () within the table.
- Both HVDC options for this connection will be Three ended circuits with number HVDC convertor stations indicated above required at all three ends.

- **Substation works**
  - Extension to Bramford substation by 2 bays to accommodate new circuits.
  - New Connection Substation able to accommodate 12 bays.
  - Extension to Tilbury 400kV Substation by 2 bays to accommodate new circuits.

Table 12.1 – below sets out the capital costs for option EAS 2 considering substation works and each technology option.

Item	Need	EAS 2 Capital Cost			
Substation Works	Facilitate generation and connect new circuits		£141.3m		
New Circuits		**AC OHL**	**AC Cable**	**AC GIL**	**HVDC (Min 4000 MW rating)**
New Circuit 100 km	New Circuit across EC5 and LE1	£398.0m	£4,290.0m	£4,326.0m	£3,331.7m (£2,221.1.m)
Total Capital Cost		**£539.3**	**£4,431.3m**	**£4,467.3m**	**£3,473.0m (£2,362.4)**

12.4.4 Table 12.2 below sets out the Circuit Lifetime Cost for the new circuit options, the Circuit Lifetime Costs are different for each circuit technology and are included as a differentiator between technologies. These costs are calculated using the methodology described in Appendix D.

Table 12.2 – EAS 2 Circuit Lifetime Cost Summary

Land Based option	EAS 2 AC OHL	EAS 2 AC Cable	EAS 2 AC GIL	EAS 2 HVDC (Min 4000 MW rating)
Capital Cost of New Circuits	£398.0m	£4,290.0m	£4,326.0m	£3,331.7 (£2,221.1m)
NPV of cost of losses over 40 years	£280.0m	£206.3m	£130.2m	£706.9m (£471.2m)
NPV of operation & maintenance costs over 40 years	£5.8m	£19.7m	£5.9m	£257.9m (£114.7m)
Circuit Lifetime Cost of new circuits	**£684m**	**£4,516m**	**£4,462m**	**£4,297m (£2,807m)**

12.4.5 From the environmental and technical appraisal considered, alongside capital and Circuit Lifetime Costs, the preferred option for EAS 2, 100 km connection between Bramford via New Connection Substation and Tilbury 400kV substations would be for an AC circuit connection. In light of this analysis, our starting presumption for further development of this option should it be selected, would be for a majority overhead line connection.

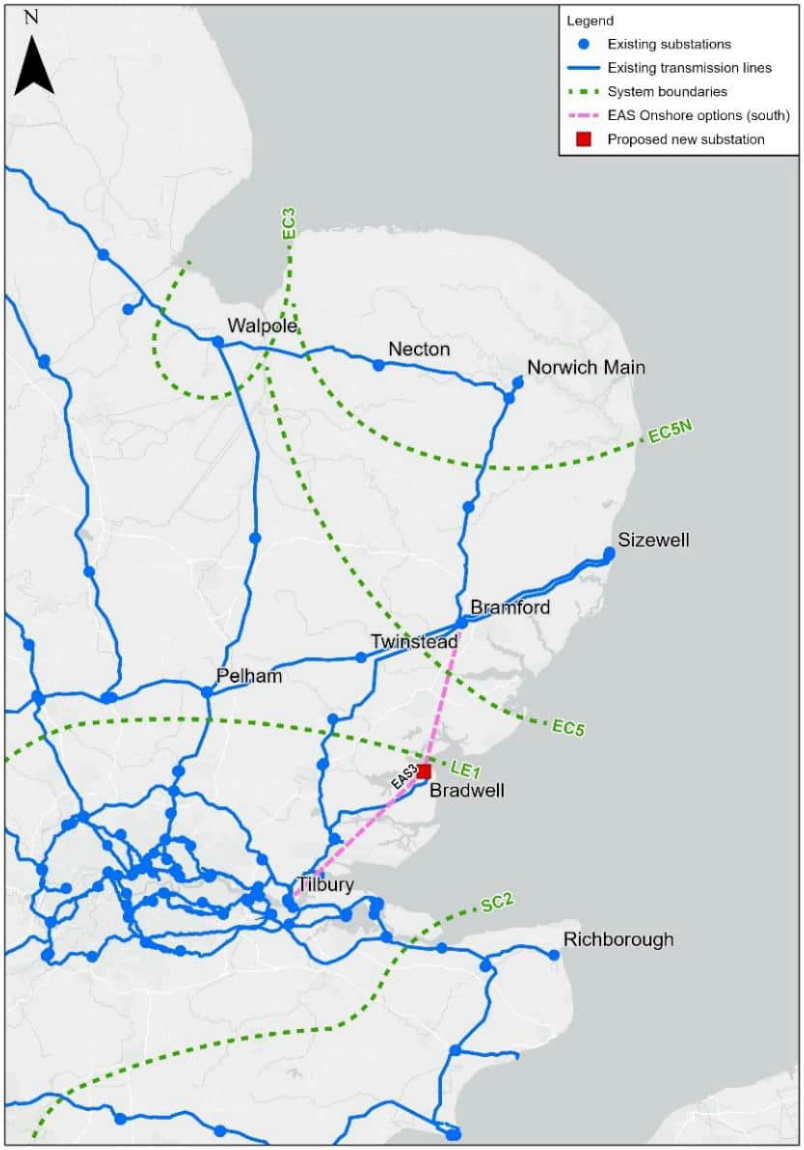
13. EAS3 – Bramford via new substation at Bradwell to Tilbury

13.1 Introduction

13.1.1 Strategic option (SO) EAS 2 involves a new 400kV transmission connection between the existing substation at Bramford via a new substation at Bradwell enroute and the existing Tilbury substation, a distance of approximately 130 km. shown in Figure 13.1.

13.1.2 This option facilitates the contracted Essex Cost Generation Group including Tarchon Interconnector, North Falls and Five Estuary offshore wind generation at a new Bradwell substation point of connection. The location of a new substation at Bradwell would be in the vicinity of the decommissioned Bradwell nuclear power station and existing lower voltage substation.

Figure 13.1 – Option EAS 2 Bramford via New Substation to Tilbury



13.2 Environmental appraisal

Landscape and visual

13.2.1 Much of the study area comprises constraints to an AC OHL, some of which can be addressed by conventional approaches e.g., routeing/ paralleling. Whilst it should be possible with this option to avoid some potential adverse effects on the landscape and visual amenity of the Dedham Vale AONB and South Suffolk and North Essex Claylands NCA, it is considered unlikely that all of the impacts could easily be mitigated, and significant residual effects are therefore possible. It is also expected that there would be adverse visual effects to residents along affected settlement edges, scattered properties, and visitors to RPGs and Country Parks through increased 'wirescape'.

13.2.2 The Dedham Vale AONB is avoidable within this study area, although to route from Bramford to a new substation at Bradwell would require a significantly longer AC OHL route.

13.2.3 A route through the AONB would require at least 5km of undergrounding. Careful route alignment/ siting is important to minimise long term effects on characteristic and highly sensitive landcover, such as Ancient Woodland (considered irreplaceable) as a result of installing an underground connection. Trenchless installation or other technology might be required to avoid effects on Ancient Woodland cover.

13.2.4 Careful siting and design of the new substation Bradwell would likely have some adverse landscape and visual impacts due to its location on the coastline at the mouth of the estuary of the Rivers Colne and Blackwater; albeit there is exiting large infrastructure already present locally.

13.2.5 This option is significantly constrained, however, some opportunities exist for mitigation through more detailed assessment, siting, routeing and construction or installation which would reduce the potential for some significant landscape and visual effects.

Historic environment

13.2.6 Parks and Gardens and scheduled monuments are distributed throughout the corridor, although there is a large concentration of scheduled monuments to the south of Colchester, and two scheduled monuments flank the existing Tilbury power station. Two extensive Parks and Gardens (Weald Park and Thorndon Hall) also occupy a large area of land near Brentwood.

13.2.7 Military defences exist throughout the area, however there are relatively few significant clusters. Small clusters have been recorded along the A20, where the remains of a Second World War 'stop line' can be traced. Other non-designated assets have not been considered as part of the assessment.

13.2.8 It is likely that designated assets, such as scheduled monuments and listed buildings would be avoidable. Physical impacts are likely to be limited to non-designated assets and previously unrecorded assets, although these were not assessed as part of this options appraisal.

13.2.9 There is the potential for significant impacts on the setting of high value designated assets identified throughout the study area. This could include routeing near areas of previous disturbance, as well as limiting above ground infrastructure in areas of high value receptors.

13.2.10 Mitigation would be required, and could include a phased programme of works including geophysical survey, archaeological evaluation trenching, and full archaeological excavation to mitigate physical impacts.

Ecology

13.2.11 Whilst European and national designated sites are likely to be avoidable to route to and from a new substation at Bradwell would require the AC OAC to be routed around Colne and Blackwater Estuary and then back again from Bradwell which would increase the length of the AC OHL unless an underground solution was used to cross this feature and associated designated sites.

13.2.12 Whilst sites are avoidable large proportion of the eastern side of the study area is designated as SPAs on the eastern edge of the study area. Routeing would therefore need to consider bird flight paths. Opportunities may exist to parallel the existing 4VB overhead line, this may reduce potential for collision risk due to bird species being habituated in this area. Should a parallel solution be achievable to minimise potential impacts on species of bird this would require the AC OHL to cross an RSPB reserve to the northeast of Tilbury. Consideration of the East Atlantic Flyway WHS nomination will also be required but as set out at Section 6.5 is not anticipated to modify the outcome informed by considerations SPA and similar designations.

13.2.13 Recognised mitigation measures for AC OHL impacts to bird assemblages would need to be used wherever appropriate. Mitigation for impacts of AC OHL prioritise eliminating exposure by undergrounding sections where there is a greater risk or routeing the AC OHL away from important bird areas. Secondary measures for reducing likely impacts to birds from AC OHL include installing bird diverters and embedding measures into the design (e.g., insulated components, greater air space between lines).

13.2.14 The potential for a likely significant effect on these sites would need to be considered in relation to the Conservation of Habitat and species Regulations 2017.

Physical environment

13.2.15 It is likely that a significant amount of development would be located within the floodplain. As flood water can ingress around pylon footprints this is unlikely to result in a significant effect once operational, however temporary impacts could arise where construction works are located within these zones.

13.2.16 Crossings of main rivers, Flood Zones 2 or 3 are likely to be unavoidable.

13.2.17 Significant operational effects are unlikely however a principal consideration is the management of construction works within Flood Zones 2 and 3.

13.2.18 It is likely that a new substation at Bradwell could be located outside of flood zones 2 or 3.

13.2.19 Any extension to Tilbury substation would be within Flood Zone 3 therefore additional mitigation measures may be required.

13.3 Socio-economic appraisal

Settlements and populations

13.3.1 There are 22 main settlements within this study area and population density increases towards the south where it is likely that a new AC OHL would need to be routed near to settlements.

13.3.2 Temporary adverse impacts could arise if the AC OHL is situated within close proximity to settlements during construction associated with noise, air quality and construction traffic. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal.

Tourism and recreation

13.3.3 There are a number of NCNs routes within this study area. It is considered multiple cycle routes would be unavoidable within this option. There are also 27 Country Parks. These are found slightly more to the southern half of the study area with a cluster between Brentwood and Basildon.

13.3.4 There is the potential for temporary adverse effects associated with severance should cycle routes need to be temporarily closed during construction, however this is likely to be the case with any option, and effects would be temporary. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal on users of NCN, and these effects would be permanent.

13.3.5 Standard best practice guidelines should be followed to provide appropriate signage, diversion routes and notice for the users of the cycle route should part of a cycle route be closed during construction.

Land use

13.3.6 Grade 1 BMV land is located in the east of the study area. Grade 2 BMV land is fragmented throughout this study area. Grade 3 BMV agricultural land is prominent land type classification in the study area. Bramford Substation is located on Grade 2 BMV land. Loss of BMV likely to be limits for the OHL route but could be more significant where there are new substations.

13.3.7 There is the potential for temporary adverse impacts on agricultural land during construction. There is the potential for permanent loss associated with pylon footprints but this is unlikely to be significant. Loss of BMV due to the substation should be avoidable. Other land uses are likely to be avoidable.

13.3.8 There is the potential to oversail a golf course, other land uses could be avoided by routeing where possible.

Infrastructure

13.3.9 The M25 motorway, A13, A1089, and A282 are located in the southwest corner of this study area. The A12 extends diagonally across the study area between Ipswich and Brentwood. The A120 extends across the study area in the north between Braintree and Harwich. The A14 extends around the urban settlement of Ipswich. It is considered that the A120 and A12 are unavoidable.

13.3.10 There are railway lines within this study area. Railway lines connect the urban settlements described above. It is considered at least three railway lines, and possibly more, would need to be crossed within this option.

13.3.11 Ten aerodromes are located within this study area, including Damyns Hall Aerodrome, Elsett, Essex Air Ambulance Airbase/Earls Colne Airfield, Great Oakley Airfield, London Southend Airfield, Napps Field, Stoke Golding Airfield, Stow Maries Aerodrome, Wattisham Airfield and an unnamed airfield located at Great Wakering. Ten ports and harbours area located within this study area including Chatham Docks, Cliff Quay, Harwich International Port, Ipswich Wet Dock, London Cruise Terminal, London Gateway Port, London Thamesport, Port of Felixstowe/Freightliner Terminal, Tilbury Docks, Town Pier. The locations of airfields and ports/harbours are considered avoidable.

13.3.12 Where crossings are required, there is the potential for temporary closure of roads during construction. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal on users of roads and railways.

13.3.13 Standard best practice guidelines should be followed to provide appropriate signage, diversion routes and notice to the public who use the roads should these be temporary closed during construction.

13.3.14 The route would have to pass over gas transmission pipelines, these areas could require additional cathodic protection methods.

13.3.15 Routeing of a new AC OHL would have to take account of the ten aerodromes located within this study area. Potential requirement for routeing away from exclusion zones and aviation warning lighting on the top of the transmission towers if their location is considered a significant navigational hazard.

13.4 Technical scope and costs

13.4.1 Technical analysis of option EAS 3 is as follows:

- This option to connect a 130km circuit between Bramford via New Bradwell Substation and Tilbury, takes energy south via a New Bradwell Substation to the existing substation at Tilbury.
- This option facilitates the contracted Essex Cost Generation Group including Tarchon Interconnector, North Falls and Five Estuary offshore wind generation at a new Bradwell Substation point of connection.
- To make the connection to the New Bradwell substation at the old connection site would require crossing the river Blackwell at a distance of >5km. To make this crossing a river tunnel and cables would need to be used. This would add significant cost to this option with £200m of cable costs, for OHL options and >£100m tunnelling costs for all AC options.
- The existing Bradwell substation and the overhead line connecting to it are operate at 132kV. Both the substation and the circuit would need to be replaced by a substation and overhead line of 400kV capability with completely new infrastructure.

13.4.2 We undertake a cost evaluation of the following four technologies for onshore options evaluation.

a) 400 kV alternating current (AC) overhead line

b) 400 kV AC underground cable

c) 400 kV AC gas insulated line (GIL)

d) 525 kV high voltage direct current (HVDC) underground cable and converter stations

13.4.3 Option EAS 3 requires the following transmission works to satisfy the requirements of the SQSS.

- **New circuit requirements**
  - AC connections options use hi-capacity double circuits (two 400 kV AC circuits) with a total capacity of up to 6930 mega volt amperes (MVA) or;
  - HVDC using 525 kV 2000 MW voltage source links, which would require a convertor station at each end similar in size to a large warehouse. A 6000 MW connection would require three convertor stations at each end, nine overall, this is to come close to matching the AC hi-capacity circuits of 6930 MVA.
  - The original assessment minimum HVDC requirement to connect contracted generation, with no ability to accommodate future applications is 4000 MW capability requiring two convertor stations at each end, six overall, this cost is included in brackets () in the table.
  - Both HVDC options for this connection will be Three ended circuits with number HVDC convertor stations indicated above required at all three ends.
- **Substation works**
  - Extension to Bramford substation by 2 bays to accommodate new circuits.
  - New Bradwell Substation able to accommodate 12 bays.
  - Extension to Tilbury 400kV Substation by 2 bays to accommodate new circuits.

Table 13.1 – below sets out the capital costs for option EAS 3 considering substation works and each technology option.

Item	**Need**	**EAS 3 Capital Cost**			
Substation Works	Facilitate generation and connect new circuits			£141.3m	
New Circuits		**AC OHL**	**AC Cable**	**AC GIL**	**HVDC (Min 4000 MW rating)**
New Circuit 100 km	New Circuit across EC5 and LE1	£517.4	£5,610.8m	5,623.8m	£3,609.8m (£2,406.5m)
Total Capital Cost		**£658.7m**	**£5,752.1m**	**£5,765.1m**	**£3,751.m (£2,547.8m)**

13.4.4 Table 13.2 below sets out the Circuit Lifetime Cost for the new circuit options, the Circuit Lifetime Costs are different for each circuit technology and are included as a differentiator between technologies. These costs are calculated using the methodology described in Appendix D.

Table 13.2 – EAS 3 Circuit Lifetime Cost Summary

Land Based option	**EAS 3 AC OHL**	**EAS 3 AC Cable**	**EAS 3 AC GIL**	**EAS 3 HVDC (Min 4000 MW rating)**
Capital Cost of New Circuits	£517.4m	£5,610.8m	£5,623.8m	£3,609.8m (£2,406.5m)
NPV of cost of losses over 40 years	£364.7m	£278.3m	£169.3m	£706.9m (£471.2m)
NPV of operation & maintenance costs over 40 years	£7.6m	£26.7m	£7.7m	£258.2m (£172.1)
Circuit Lifetime Cost of new circuits	**£890m**	**£5,916m**	**£5,801m**	**£4,575m (£3,050m)**

13.4.5 To make the connection at a new Bradwell substation would require crossing the River Blackwater with a minimum distance of 5km. A cable tunnel would need to be used. This would be significantly more costly (approximately £200m). The timescales likely to be required to consent, construct and commission tunnelling infrastructure would mean this option would not be deliverable by the required date in the need case.

13.4.6 From the environmental and technical appraisal considered, alongside capital and Circuit Lifetime Costs, the preferred option for EAS 3, 130 km connection between Bramford via New Bradwell Substation and Tilbury 400kV substations would be for an AC circuit connection. In light of this analysis, our starting presumption for further development of this option should it be selected, would be for a majority overhead line connection.

14. Offshore 1 – Norwich to Tilbury

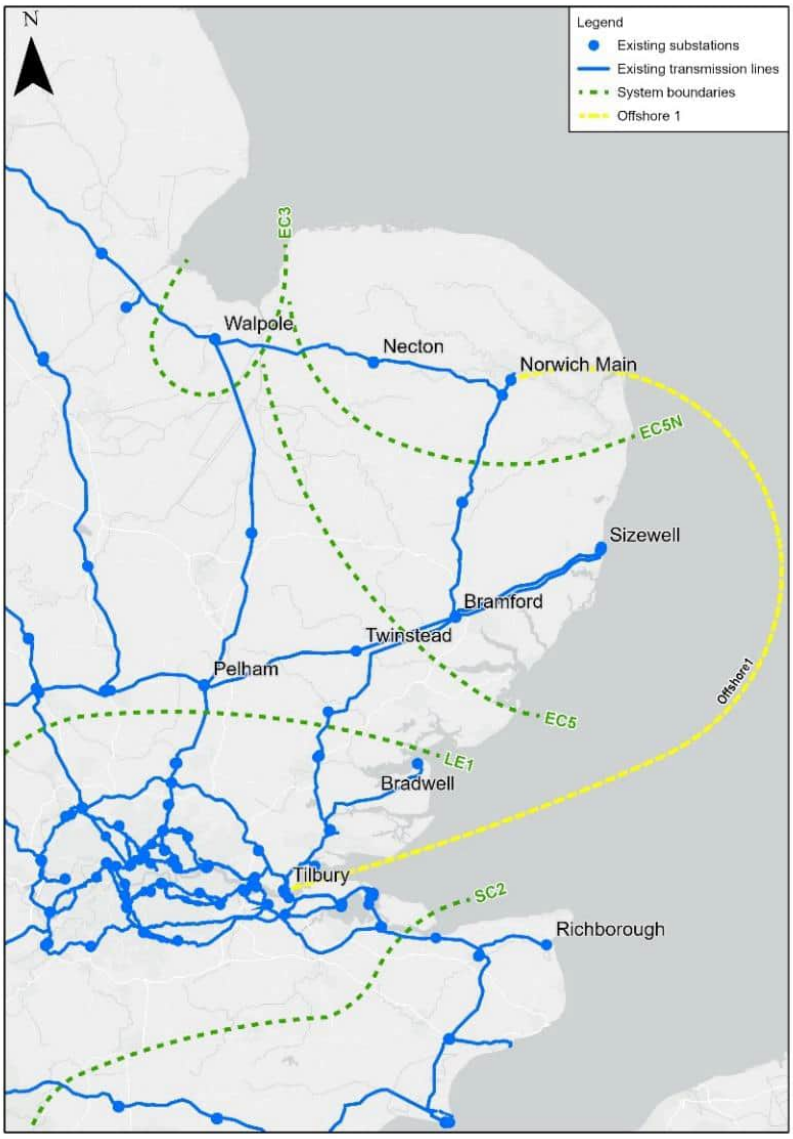
14.1 Introduction

14.1.1 Strategic option (SO) Offshore 1 involves a new offshore transmission connection between the existing substation at Norwich Main and the existing Tilbury substation, a distance of approximately 220 km. This option is shown in Figure 14.1.

14.1.2 This option could facilitate the contracted Essex Cost Generation Group including Tarchon Interconnector, North Falls and Five Estuary offshore wind generation at offshore substations.

14.1.3 This option does not provide the flexibility of onshore connection options which facilitate flows both to the West and East of the transmission system for different system faults. This option only provides flows to the East of London, whereas energy demand is distributed throughout England so this option would not be as effective for all system conditions compared with the combination of an EAN and EAS option.

Figure 14.1 – Option Offshore 1 Norwich to Tilbury



14.2 Environmental appraisal

Landscape and visual

14.2.1 Two nationally designated landscapes are present in the study area, the Broads National Park and Suffolk Coast and Heaths AONB. Within the study area there would be very little opportunity to avoid both the National Park and AONB without the introduction of a longer onshore route.

14.2.2 The main constraint would be siting converter stations at Norwich near to The Broads National Park.

14.2.3 Converter Stations would present the only long-term adverse effect during operation.

14.2.4 This option has some constraints and would need to route/ site carefully through the areas near the Broads National Park and Suffolk Coast & Heaths AONB. Some opportunities exist for mitigation through more detailed assessment, siting, routeing and construction which would reduce the potential for some visual effects. Some limited significant residual visual effects are possible.

Historic environment

14.2.5 Scheduled monuments are distributed throughout the study area and include sites dating from the prehistoric period onwards. While examples of scheduled monuments have been recorded throughout the study area, there are a number of areas where large scheduled monuments/concentrations of sites have been recorded. At the north end these include the remains of a Roman and medieval town on the south side of Norwich, near the Norwich Trowse and Norwich substation, as well as a cluster of medieval assets (including moated sites) in north Suffolk, and a focus near Great Yarmouth which includes the town walls.

14.2.6 Scheduled Monuments have been recorded around the Tilbury substation area.

14.2.7 Listed buildings have been recorded throughout the northern and southern landfall Options, with the vast majority being Grade II listed, although a relatively large number of Grade I and II* buildings have been recorded due to the size of the areas. These are mainly located within settlements scattered throughout the northern and southern landfalls, although Grade II listed buildings have also been recorded throughout the landscape.

14.2.8 A number of registered parks and gardens have also been recorded throughout the northern terrestrial study area, although no registered parks and gardens have been recorded in the southern section.

14.2.9 No registered battlefields have been recorded.

14.2.10 Although a review of non-designated assets was not undertaken as part of the current scheme, the Defence of Britain data set was examined and a large number of assets were recorded in the study area. These include a large concentration of defensive structures following along the coastline in both the north and south.

14.2.11 There are some protected wrecks in the study area including the South Edinburgh Channel and the London in the mouth of the Thames Estuary NE of Grain however these are likely to be avoidable through routeing.

14.2.12 It is likely that designated assets, such as scheduled monuments and listed buildings would be avoided. Physical impacts are likely to be limited to non-designated assets and previously unrecorded assets, although these were not assessed as part of this options appraisal.

14.2.13 Impacts on the setting of assets, where setting contributes to significance is likely to be limited to areas close to converter stations and the substation extensions.

Ecology

14.2.14 European and national designated sites are unlikely to be avoidable in particular at the landfalls at either end. Whilst effects arising from cable installation are likely to be temporary the potential for significant effect would depend on the habitat types that are present and their recoverability. Trenchless construction techniques could be used at landfalls to avoid direct effects on these designated sites, but these have technical limitations.

14.2.15 Onshore close to Norwich whilst designated sites maybe avoidable there is still the potential for effects associated with the interconnected habitats associated within the Broadland system.

14.2.16 The potential for a likely significant effect on these sites would need to be considered in relation to the Conservation of Habitats and Species Regulations 2017.

Physical environment

14.2.17 It is likely that a significant amount of onshore development would be located within the floodplain, whilst underground cable would not lead to any operation impacts, temporary impacts could arise where construction works are located within these zones.

14.2.18 Crossings of main rivers, Flood Zones 2 or 3 are likely to be unavoidable.

14.2.19 Significant operational effects are unlikely however a principal consideration is the management of construction works within Flood Zones 2 and 3.

14.2.20 Offshore the Thames estuary is a dynamic environment with sediment fluctuations. Kentish Flats, Gunfleet and Sunk Sand are areas of shallow water off the north Kent and Essex coasts. Any cable protection measures associated with cable or crossings of other infrastructure or any cable spanning within Kentish Flats and Gunfleet could result in an unacceptable reduction in water depth and an increased risk to shipping and navigation. Mobile sediment could also result in cable spanning or over burial of the cables.

14.2.21 Within the Thames estuary the deposition of large volumes of sediment during glacial times and its subsequent movement by the sea has created large features, such as sand banks and sandwave fields, which have a direct impact on the bathymetry profile of the Thames Estuary. The bathymetry in the Thames Estuary is dominated by the positions of the large sandbanks and the associated channels. The area is considered very active with continuing shifting/migration of the sand banks and channels.

14.2.22 The sandbanks comprise sands and muddy sands whilst in the channels the sediments can be very thin generally a few centimetres (cm) thick and comprise a veneer of gravel, sandy gravels and gravelly sands. The gravels generally comprise of flint or of calcareous concretions derived from the underlying London Clay. The underlying London Clay is present beneath the surficial sediments except where Quaternary infilled river channel deposits are present. The Eocene London Clay is comprised principally of stiff to very stiff marine silty clays, clayey and sandy silts with subordinate sands. The basal unit has hard cemented layers of argillaceous ash known as the Harwich Member.

14.3 Socio-economic appraisal

Settlements and populations

14.3.1 Temporary adverse impacts could arise if the underground cable route is situated within close proximity to settlements during construction associated with noise, air quality and construction traffic. There is the potential for adverse visual effects from the presence of converter stations which are set out in the landscape and visual appraisal.

Tourism and recreation

14.3.2 The Broads National Park lies within the northern onshore part of the study area this is unlikely to be avoidable without the introduction of a longer onshore route.

14.3.3 There are eight NCNs within this study area and are more prominent in the northern section. At least three national cycle routes would be unavoidable though it is considered that more would likely be unavoidable.

14.3.4 There are six Country Parks with four distributed through the northern onshore part of the study area and the remaining two to the south.

14.3.5 Routeing through the National Park should be avoided. This could be achieved through a longer onshore route.

14.3.6 There is the potential for temporary adverse effects associated with severance should cycle routes need to be temporarily closed during construction. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal on users of NCN.

14.3.7 Standard best practice guidelines should be followed to provide appropriate signage, diversion routes and notice for the users of the cycle route should part of a cycle route be closed during construction.

Land use

14.3.8 It is considered Grade 1 BMV land is avoidable with careful routeing, however it is considered likely Grade 2 BMV land would be unavoidable.

14.3.9 There is the potential for temporary adverse impacts on agricultural land during construction. There is the potential for permanent loss associated with converter station siting, this should seek to avoid BMV land where possible. Other land uses are likely to be avoidable.

14.3.10 Consideration would need to be given to inshore fishing areas of importance via project specific consultation with fishermen once route selection process has been refined. Presence of rock placement can cause significant issues for bottom trawled gear in particular but it is not possible to clearly identify these areas at this stage.

14.3.11 There are a number of offshore mineral aggregate extraction areas located within the study area.

14.3.12 This option could result in disturbance to fisheries and reduction in access to fishing grounds-potential hazard from rock protection.

Infrastructure

14.3.13 There are multiple trunk roads within this study area, including the A249 in the south, A47 in the north. The A13 and A1089 are located in the northwest in the urban settlement Grays. The A249 is avoidable. There is the potential for the A47 to be crossed.

14.3.14 There are a number of railway lines within this study area. At least two railway lines would be unavoidable within this option.

14.3.15 Seething Airfield and Beccles Airfield are located in the north. It is considered the airports and ports are avoidable.

14.3.16 Where crossings are required, there is the potential for temporary closure of roads during construction. There is the potential for adverse visual effects which are set out in the landscape and visual appraisal on users of roads and railways.

14.3.17 Standard best practice guidelines should be followed to provide appropriate signage, diversion routes and notice to the public who use the roads should these be temporary closed during construction.

14.3.18 The route would have to pass over gas transmission pipelines, these areas could require additional cathodic protection methods.

14.3.19 Offshore there is a significant amount of infrastructure within the study area including numerous existing and proposed subsea cables/pipelines and offshore wind farms with associated substations and cables including Gridlink, NeuConnect and Britned interconnectors and potentially export cables from the Five Estuaries and North Falls OWFs, Nautilus and Lionlink (formerly Eurolink) proposed interconnectors and Greater Gabbard/Extension, Galloper/Extension, EA2, London Array and Kentish Flats OWFs.

14.3.20 Crossings with existing and proposed infrastructure would be required. Consideration would need to be given to the potential for an unacceptable reduction in water depth presenting a hazard to vessels in areas of shallow water. Additionally, crossings requiring rock protection within designated sites may present issues.

Shipping and navigation

14.3.21 The River Thames is a key navigation route supporting the passage of both freight and passenger shipping. Under the Port of London Act 1968 (as amended), PLA are responsible for maintaining and supervising navigation on the tidal River Thames from the lock gates at Teddington as far as the Thames Estuary where it meets the North Sea. The main navigational approaches through the Thames Estuary to the River Thames are along Princes Channel in the south and Black Deep and Barrow Deep to the north converging into the Yantlet Channel along the inner Thames Estuary and the River Thames. In the section between the Thames Estuary and Tilbury Substation over 10,000 ships per year are recorded to be transiting the Thames. The study area incorporates the SUNK TSS and is in the vicinity of the Harwich/Felixstowe dredged shipping Channel and other deep water navigation channels.

14.3.22 A number of channels including Yantlet are dredged for navigation to maintain an appropriate safe depth of water for navigation and this is likely to result in a significant constraint to cable routeing. Dredging would both pose a risk to the asset itself as well and safety concern for the dredging works. It is considered unlikely the PLA would grant consent for a River Works Licence for a cable route along a dredged shipping channel.

14.3.23 Either side of the main Yantlet channel are a number of anchorage areas and anchor berths. Anchorage areas would pose a risk to the asset itself from cable strike as well and safety concern for and vessels dropping their anchors. As the anchorage areas are fundamental to the operation of the major ports along the Thames It is considered unlikely the PLA would grant consent for a River Works Licence for a cable route that would impact on the operation of the anchorage areas or pose a safety risk.

14.3.24 The Thames Estuary is a dynamic environment and sediment levels within the estuary fluctuate which is one of the reasons some of the shipping channels needs to be dredged. As cable burial death is normally around a metre, however, a dynamic environment can lead to the cable becoming either exposed or buried deeper than the original installation depth. Should the cable before exposed remedial measures such as rock placement can be used to protect the asset. Should it become buried deeper there could be issues with heating which would affect the transmission capacity of the cable. Within the nearshore areas it is considered likely that any remedial rock placement would reduce the water depth and create an increased risk to shipping and navigation within these waters. As a result it is considered unlikely that the PLA would grant consent for a River Works Licence for a cable and protection measures that reduce the water depth in the nearshore shallow waters and may require re-burial in the future.

14.3.25 It is considered that shipping and navigation poses a significant constraint for the installation of a cable along the Thames Estuary to Tilbury due to the limited availability to avoid shipping channels, dredged shipping channels which would pose a risk and reauctions in water depth from remedial proception measures posing a risk to shipping and navigation.

14.3.26 There may be opportunities to mitigate the risk posed by Navigational issues and the regular dredging of shipping routes in the Thames Estuary such as deeper burial. These should be considered should a marine strategic option to Tilbury be selected as the preferred option.

14.4 Technical scope and costs

14.4.1 Technical analysis of option Offshore 1 is as follows:

- This option to connect a 220km offshore subsea circuit between Norwich via and Tilbury, takes energy south subsea to the existing substation at Tilbury.
- This option could facilitate the contracted Essex Cost Generation Group including Tarchon Interconnector, North Falls and Five Estuary offshore wind generation at offshore substation points of connection.
- This option does not provide the flexibility of onshore connection options which facilitate flows both to the West and East of the transmission system for different system faults. This option only provides flows to the East of London, whereas energy demand is distributed throughout England so this option would not be as effective for all system conditions compared with the combination of an EAN and EAS option.

14.4.2 We undertake a cost evaluation of the following four technologies for offshore options evaluation.

a) 400 kV AC Subsea cable

b) 525 kV high voltage direct current (HVDC) underground cable and converter stations

14.4.3 Option Offshore 1 requires the following transmission works to satisfy the requirements of the SQSS.

- **New circuit requirements**
  - AC connections options use hi-capacity double circuits (two 400 kV AC circuits) with a total capacity of up to 6930 mega volt amperes (MVA) or;
  - HVDC using 525 kV 2000 MW voltage source links, which would require a convertor station at each end similar in size to a large warehouse. A 6000 MW connection would require three convertor stations at each end, seven overall, this is to come close to matching the AC hi-capacity circuits of 6930 MVA.
  - The original assessment minimum HVDC requirement to connect contracted generation, with no ability to accommodate future applications is 4000 MW capability requiring two convertor stations at each end, five overall, this cost is included in brackets () in the table.
  - One of the HVDC circuit for this connection will be Three ended with an additional HVDC convertor on offshore platform to facilitate generation connections.
- **Substation works**
  - Extension to Norwich substation by 2 bays to accommodate new circuits.
  - New Offshore Platform to facilitate connection of North Falls and Five Estuaries.
  - Extension to Tilbury 400kV Substation by 2 bays to accommodate new circuits.

Table 14.1 – below sets out the capital costs for option Offshore 1 considering substation works and each technology option.

Item	**Need**	**Offshore 1 Capital Cost**	
Substation Works	Facilitate generation and connect new circuits	£186.8m	
New Circuits		**AC Offshore Cable**	**Offshore HVDC (Min 4000 MW rating)**
New Circuit 220 km	New Circuit across EC5 and LE1	£9,501.8m	£3,909.7m (£2,695.6m)
Total Capital Cost		**£9,688.6m**	**£4,096.5m (£2,882.4)**

14.4.4 Table 14.2 below sets out the Circuit Lifetime Cost for the new circuit options, the Circuit Lifetime Costs are different for each circuit technology and are included as a differentiator between technologies. These costs are calculated using the methodology described in Appendix D.

Table 14.2 – Offshore 1 Circuit Lifetime Cost Summary

Land Based option	Offshore 1 AC Offshore Cable	Offshore 1 Offshore HVDC (min 4000 MW rating)
Capital Cost of New Circuits	£9,501.8m	£3,909.7m (£2,695.6m)
NPV of cost of losses over 40 years	£476.0m	£549.8m (£392.7m)
NPV of operation & maintenance costs over 40 years	£45.2m	£201.8m (£144.1m)
Circuit Lifetime Cost of new circuits	**£10,023m**	**£4,661** **(£3,232m)**

14.4.5 From the environmental and technical appraisal considered, alongside capital and Circuit Lifetime Costs, the preferred option for Offshore 1, 220 km connection between Bramford and Tilbury 400kV substations by offshore connection, would be for a Subsea HVDC circuit connection. In light of this analysis, our starting presumption for further development of this option should it be selected, would be for a majority overhead line connection.

14.4.6 Should this circuit at full 6000 MW capacity made multiterminal to provide the same system flexibility as the AC circuit options. There would be a need for an additional three sets of HVDC convertor stations and three sets of 50km HVDC cable to connect to Bramford, to make multi-terminal HVDC links. This would add an additional £1,265.1m of capital cost and increase Circuit Lifetime Cost by £1,587m. This would give overall capital costs of £ 5361.1m (£4,096.5m + £1,265.1m), and overall Circuit Lifetime Cost of £6,248m (£4,661m + £1,587m).

15. Strategic options appraisal conclusions

15.1 Introduction

15.1.1 This Strategic Options Backcheck and Review has considered the following options:

Circuits to the North of East Anglia

- EAN 1 – Necton to Pelham 115km
- EAN 2 – Necton to Twinstead 90km
- EAN 3 – Necton to Bramford 85km
- EAN 4 – Norwich Main to Bramford 80km

Circuits to the South of East Anglia

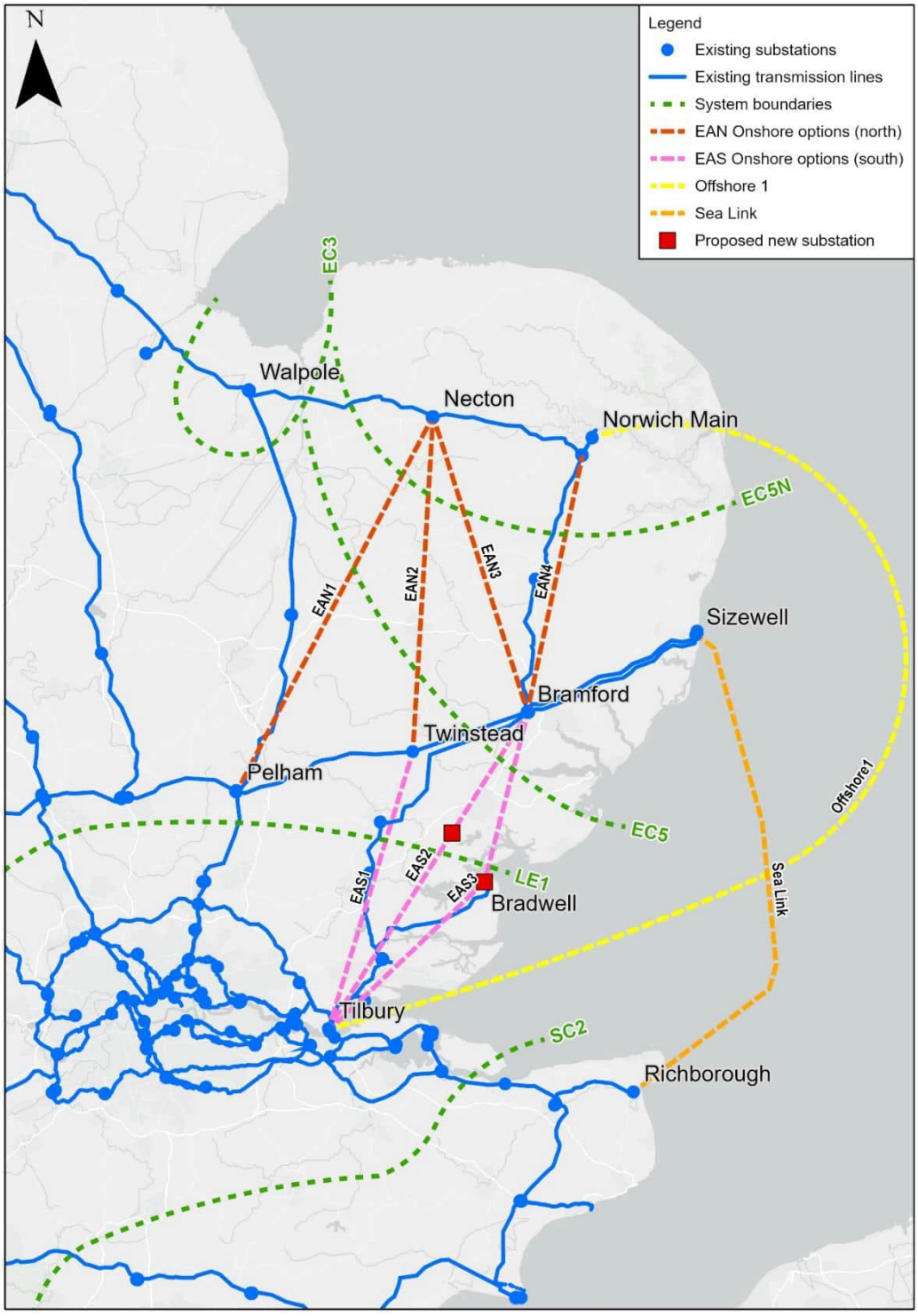
- EAS 1 – Twinstead to Tilbury 80km
- EAS 2 – Bramford via New Substation to Tilbury 100km
- EAS 3 – Bramford via New Substation at Bradwell to Tilbury 130km

Offshore Coastal East Anglia

- Offshore 1 – Norwich Main to Tilbury 220km

15.1.2 These are shown in Figure 15.1 below.

Figure 15.1 – options considered in this Strategic Options Backcheck and Review



15.1.3 A combination of the strategic options (set out in Table 15.1) are necessary for both onshore and offshore options. The table below sets out the combinations that are required and which boundary or group condition they support.

Table 15.1 – Combination of Options required to meet need

<table>
<tr><th>Boundary or Group</th><th colspan="4">Onshore Options</th><th>Offshore</th></tr>
<tr><td>EC5N & EC3</td><td>EAN 1</td><td>EAN 2</td><td>EAN 3</td><td>EAN 4</td><td rowspan="2">Offshore 1</td></tr>
<tr><td>EC5 & LE1</td><td colspan="2">EAS 1</td><td>EAS 2</td><td>EAS 3</td></tr>
<tr><td>SC2, EC5, LE1 & Sizewell</td><td colspan="5">Sea Link</td></tr>
</table>

15.1.4 Any combination of one northern (EAN) and one southern (EAS) onshore options can be used to meet the need onshore, whilst Offshore 1 would be required to meet the need offshore. A Sea Link interactivity assessment is included in this document to show how it contributes 2000 MW of capacity to the SC2, EC5, LE1 and Sizewell generation group. The full Sea Link project is subject to its own option assessment.

15.1.5 As outlined in further detail in the previous sections, this backcheck and review considers for each option:

- environmental and socio-economic constraints;
- technology options available and the associated technical considerations; and
- the capital and Circuit Lifetime Costs of each technology option.

15.1.6 The remainder of this section summarises these considerations across the available options.

15.2 Environmental and socio-economic considerations

15.2.1 Tables 15.1 and Table 15.2 below summarise the environmental and socio-economic constraints for each option. Whilst all options would have impacts, none appear to present environmental issues that could not be mitigated with careful consideration of routeing and use of appropriate technologies and mitigation measures to specific constraints, as is consistent with the extant and emerging NPSs against which proposals for nationally significant infrastructure projects are assessed.

15.2.2 For northern onshore options, a principal consideration is the Breckland SPA/ SAC/SSSI complex. Whilst avoidable there is the potential for impacts on the interest features associated with both habitats and species. For the Offshore 1 option, European and national designated sites are unlikely to be avoidable, in particular at the landfalls at either end. Other considerations and potential impacts in the socio-economic assessment are broadly similar for all northern onshore options, with a variety of features present that would need to be avoided, or impact mitigation provided, for all of the options.

15.2.3 For all onshore options, overhead line options would generally be optimal given their lower cost and the ability to mitigate their impacts through careful routeing and design. A key consideration for southern onshore options is the Dedham Vale AONB, which – as discussed in further detail above – is within the study area for onshore options EAS 1, EAS 2 and EAS 3. In the case of EAS 1 it should be possible to avoid effects on the AONB through routeing. In the case of EAS2 and EAS3 the AONB could only be avoided with significantly longer routes.

15.2.4 In the case of option Offshore 1 there would be limited opportunity to avoid the Broads National Park and Suffolk Coast and Heaths AONB. However, some opportunities exist for mitigation through more detailed assessment, siting, routeing and construction which would reduce the potential for some visual effects. National Policy relating to electricity transmission networks is set out in National Policy Statements (NPS) EN-1 (2024) and EN-5 (2024), including policy for development in nationally designated landscapes. EN-1 confirms that National Parks, the Broads and AONBs have been confirmed by the Government as having the highest status of protection in relation to landscape and scenic beauty. EN1 makes clear that development consent in these areas can be granted in exceptional circumstances. In such instances, the development should be demonstrated to be in the public interest and consideration of such applications should include an assessment of:

- the need for the development, including in terms of national considerations, and the impact of consenting or not consenting it upon the local economy;
- the cost of, and scope for, developing elsewhere outside the designated area or meeting the need for it in some other way, taking account a consideration of alternatives; and
- any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated.

15.2.5 Paragraph 2.9.7 of EN-5 states that “While the Government does not believe that the development of overhead lines is incompatible in principle with applicants’ statutory duty under Schedule 9 of the Electricity Act 1989, to have regard to visual and landscape amenity and to reasonably mitigate possible impacts thereon, in practice new overhead lines can give rise to adverse landscape and visual impacts.” Paragraph 2.9.20 states that “Although it is the government’s position that overhead lines should be the strong starting presumption for electricity networks developments in general, this presumption is reversed when proposed developments will cross part of a nationally designated landscape (i.e. National Park, The Broads, or Areas of Outstanding Natural Beauty).” Paragraph 2.9.22 goes on to state that “However, undergrounding will not be required where it is infeasible in engineering terms, or where the harm that it causes is not outweighed by its corresponding landscape, visual amenity and natural beauty benefits. Regardless of the option, the scheme through its design, delivery, and operation, should seek to further the statutory purposes of the designated landscape...” Paragraph 2.9.23 states that cases will arise where – though no part of the proposed development crosses a designated landscape – a high potential for widespread and significant adverse landscape and/or visual impacts along certain sections of its route may result in recommendations to use undergrounding for relevant segments of the line or alternatively consideration of using a route including subsea cabling. In these cases, Paragraph 2.9.24 states that ...”the Secretary of State must weigh the feasibility, cost and any harm of the undergrounding or subsea option against: .

- The adverse implications of the overhead line proposal;

- The cost and feasibility of re-routing overhead lines or mitigation proposals for the relevant line section; and
- The cost and feasibility of the reconfiguration, rationalisation, and/or use of the underground or subsea cabling of proximate existing or proposed electricity networks infrastructure."

15.2.6 As noted in the assessments above, it would be possible to avoid some potential adverse effects of options EAS 2 and EAS 3 on the landscape and visual amenity of the Dedham Vale AONB and South Suffolk and North Essex Claylands NCA. However, it is unlikely that all of the impacts could easily be mitigated. Significant residual effects are therefore possible. Given the significantly greater length required to avoid the AONB, it is likely that these options would require undergrounding in the AONB.

Table 15.2 – Environmental appraisal (topics)

Option	Landscape and visual	Historic Environment	Ecology	Physical Environment
EAN1	- Likely significant residual effects are possible for residents and Registered Parks and Gardens. - Moderately to heavily constrained - It may be challenging to find a route which achieves a parallel alignment.	- A relatively large number of non-designated assets were recorded in the study area. - Designated assets are likely to be avoidable, due to the linear nature of some designated scheduled monuments avoidance is likely to introduce multiple angles to an AC OHL route. - There is the potential for significant impacts on the setting	- A principal consideration is the Breckland SPA/ SAC/SSSI complex. Whilst avoidable there is the potential for impacts on the interest features of both habitats and species. - Routeing would need to consider bird flight paths	- Would have to cross several unavoidable watercourses and that of its floodplains. - Given the extent of Flood Zones 2 & 3, it is likely that a significant amount of development would be within the floodplain.
EAN2	- The central part of the study area has a cluster of sensitive receptors; it may be challenging to find a direct route without additional mitigation. - Some significant residual effects are possible for residents - Moderately constrained - This option would not offer any close parallel opportunities	- Many military defences have been recorded; these appear to represent parts of “Stop Lines” constructed during the Second World War - Potential for significant impacts on the setting of high value designated assets	- Statutory designated sites for nature conservation are likely to be avoidable - Breckland SPA/SAC/SSSI complex is located within the western half of the study area, this would require an increased length of AC OHL - Routeing would need to consider bird flight paths	- Would have to cross over several unavoidable watercourses and associated flood zones - Likely that a significant amount of development would be within the floodplain. - Crossings of main rivers are likely to be unavoidable

Option	Landscape and visual	Historic Environment	Ecology	Physical Environment
EAN3	- Some significant residual effects are possible for residents -Moderately constrained	- There are several areas where large concentrations of sites have been recorded - Large number of Grade I and II* buildings have been recorded - Potential for significant impacts on the setting, of high value designated assets identified	- Principal consideration is the Breckland SPA/SAC/SSSI complex which is located within the northwest	- Crossings of main rivers, Flood Zone 2 or 3 and Source Protection Zone 3 are likely to be unavoidable
EAN4	- Limited constraints	- Potential for significant impacts on the setting, with many high value designated assets identified	- There is one European site within the study area	- Would have to cross over several unavoidable watercourses and associated flood zones - Crossings of main rivers, Flood Zone 2 or 3 and Source Protection Zone 3 are likely to be unavoidable
EAS1	- One nationally designated landscape, the Dedham Vale AONB - Moderately to heavily constrained	- Military defences have also been identified throughout the option, with a significant cluster to the south	- Routeing would need to consider bird flight paths	- Likely that a significant amount of development would be located within the floodplain - Crossings of main rivers, Flood Zones 2 or 3 are unlikely to be avoidable
EAS2	- Much of the study area comprises constraints, it is unlikely that all of the impacts could easily be mitigated	- Parks and Gardens and scheduled monuments are distributed throughout	- Routeing would need to consider bird flight paths	- Likely that a significant amount of development would be located within the floodplain

Option	Landscape and visual	Historic Environment	Ecology	Physical Environment
	- Would require a significantly longer AC OHL to avoid Dedham Vale AONB - Likely to require at least 5km of undergrounding -Significantly constrained	- Potential for significant impacts on the setting of the value designated assets identified		- Crossings of main rivers, Flood Zones 2 or 3 are unlikely to be avoidable - Any extension to Tilbury substation would be within Flood Zone 3 and additional mitigation measures may be required
EAS3	- Would require a significantly longer AC OHL to avoid Dedham Vale AONB - Likely to require at least 5km of undergrounding -Significantly constrained	- Two extensive Parks and Gardens occupy a large area of land near -Potential for significant impacts on the setting of the value designated assets identified	- Routeing would need to consider bird flight paths	- Likely that a significant amount of development would be located within the floodplain - Crossings of main rivers, Flood Zones 2 or 3 are unlikely to be avoidable
Offshore 1	- Very little opportunity to avoid both the National Park and AONB - The main constraint would be siting converter stations	- Large number of Grade I and II* buildings have been recorded - Some protected wrecks in the study	- European and national designated sites are unlikely to be avoidable in particular at the landfalls at either end of option	- Likely that a significant amount of development would be located within the floodplain - The bathymetry in the Thames Estuary is dominated by the positions of large sandbanks and associated channels. The area is very active with shifting/migration of the sand banks and channels

Table 15.3 – Socio-economic appraisal (topics)

Option	Settlements and populations	Tourism and recreation	Land use	Infrastructure
EAN1	- Temporary adverse impacts could arise if the AC OHL is situated within proximity to settlements during construction	- Potential for temporary adverse effects associated with severance should cycle routes need to be temporarily closed during construction	- Grade 2 BMV land is scattered throughout this study area and is considered unavoidable - Potential for temporary adverse impacts on agricultural land during construction - Potential for permanent loss associated with pylon footprints	- The A14 extends across the study are, this would be unavoidable. - The M11 and A11 would need to be crossed within this study area. - At least three railway lines would need to be crossed - Route would pass over gas transmission pipelines
EAN2	- Temporary adverse impacts could arise if the AC OHL is situated within proximity to settlements during construction	- At least four NCN's are unavoidable - Potential for temporary adverse effects associated with severance should cycle routes need to be temporarily closed during construction	- Potential for temporary adverse impacts on agricultural land during construction - Potential for permanent loss associated with pylon footprint unlikely to be significant	- At least two railway lines are unavoidable - Route would pass over gas transmission pipelines - Routeing of a new AC OHL would have to take account of the four aerodromes

Option	Settlements and populations	Tourism and recreation	Land use	Infrastructure
EAN3	- Temporary adverse impacts could arise if the AC OHL is situated within proximity to settlements during construction	- Potential for temporary adverse effects associated with severance should cycle routes need to be temporarily closed during construction	- Grade 2 BMV land is scattered throughout this study area and is considered unavoidable - Potential for temporary adverse impacts on agricultural land during construction - Potential for permanent loss associated with pylon footprint unlikely to be significant	- The A11 and A14 are unavoidable - At least two railway lines are unavoidable - Route would pass over gas transmission pipelines - Routeing of a new AC OHL would have to take account of the nine aerodromes
EAN4	- Temporary adverse impacts could arise if the AC OHL is situated within proximity to settlements during construction	- Potential for temporary adverse effects associated with severance should cycle routes need to be temporarily closed during construction	- Potential for temporary adverse impacts on agricultural land during construction - Potential for permanent loss associated with pylon footprint unlikely to be significant	-The A14 is unavoidable - At least one railway line is unavoidable -Route would pass over gas transmission pipelines - Routeing of a new AC OHL would have to take account of the three aerodromes

	Settlements and populations	Settlements and populations	Settlements and populations	Settlements and populations
EAS1	- Temporary adverse impacts could arise if the AC OHL is situated within proximity to settlements during construction	- At least three NCN's are unavoidable - Potential for temporary adverse effects associated with severance should cycle routes need to be temporarily closed during construction -15 country parks within the study area	- Potential for temporary adverse impacts on agricultural land during construction - Potential for permanent loss associated with pylon footprint unlikely to be significant	- The A120 and A12 are unavoidable - A number of railway lines extend across the entire reach of the study area and which are therefore unavoidable -Route would pass over gas transmission pipelines - Routeing of a new AC OHL would have to take account of the four aerodromes
EAS2	- Temporary adverse impacts could arise if the AC OHL is situated within proximity to settlements during construction	- Multiple cycle routes would be unavoidable within this option. - Potential for temporary adverse effects associated with severance should cycle routes need to be temporarily closed during construction - 27 country parks within study area	- Bramford Substation is located on Grade 2 BMV land - Potential for temporary adverse impacts on agricultural land during construction - Potential for permanent loss associated with pylon footprint unlikely to be significant	- The A120 and A12 are unavoidable - At least three railway lines would need to be crossed - Routeing of a new AC OHL would have to take account of the ten aerodromes - Route would pass over gas transmission pipelines

	Settlements and populations	Settlements and populations	Settlements and populations	Settlements and populations
EAS3	- Temporary adverse impacts could arise if the AC OHL is situated within proximity to settlements during construction	- Multiple cycle routes would be unavoidable within this option. - 27 country parks within study area	- Bramford Substation is located on Grade 2 BMV land. - Potential for temporary adverse impacts on agricultural land during construction. - Potential for permanent loss associated with pylon footprint unlikely to be significant	- The A120 and A12 are unavoidable - At least three railway lines would need to be crossed - Routeing of a new AC OHL would have to take account of the ten aerodromes - Route would pass over gas transmission pipelines
Offshore 1	- Temporary adverse impacts could arise if the AC OHL is situated within proximity to settlements during construction	- At least three national cycle routes would be unavoidable - 6 country parks within study area	- Likely Grade 2 BMV land would be unavoidable - Potential for temporary adverse impacts on agricultural land during construction - Potential for permanent loss associated with converter station siting. - Number of offshore mineral aggregate extraction locations within study area - Could result in disturbance to fisheries and reduction in access to fishing grounds-potential hazard from rock protection	- At least two railway lines would be unavoidable - Route would pass over gas transmission pipelines - Offshore there is a significant amount of infrastructure - Consideration would need to be given to the potential for an unacceptable reduction in water depth presenting a hazard to vessels in areas of shallow water

15.3 Technical considerations

15.3.1 Four onshore technology options were considered for the potential connections. There is extensive operational experience of both overhead lines and underground cables but limited experience of GIL and onshore HVDC for the connection distances considered.

15.3.2 Two offshore technologies were considered for potential connections. There is more operational experience of offshore HVDC systems, but there is limited experience of 400kV AC subsea cable installation and operation for the connection distances considered.

15.3.3 The strategic options have been assessed as to whether they offer any major additional system benefits for the transmission system beyond meeting the identified reinforcement need. Such benefits are considered because some degree of extra capacity may negate the need for further reinforcement works soon.

15.3.4 The onshore options provide additional system flexibility by connecting into the main transmission system between the northern and southern options. This allows better power flows when faults or maintenance occur as more routes are available than for options which cross all the boundaries without intermediate connections.

15.3.5 Of the southern onshore options, all options offer the ability to connect the contracted Essex Cost Generation Group including Tarchon Interconnector, North Falls and Five Estuary offshore wind generation. However, EAS 2 and EAS 3 do so without requiring the generators to build a significant amount of further infrastructure to connect much further inland. These options allow the opportunity to construct a new substation in the vicinity of the coast to facilitate these connections and have sufficient capacity to accommodate any further future connections from costal generation and interconnectors.

15.3.6 A proposed new small demand substation in the vicinity of Twinstead Tee is currently also included in the Bramford to Twinstead connection project, for which development consent is currently being sought. Option EAS 1 would require a complete re-design of Twinstead substation from that proposed, significantly increasing its size and land required. Furthermore, to ensure circuit continuity across EC5 boundary is maintained for a Bramford to Pelham fault, an EAN 4 and EAS 1 combination of options would require the turn-in of the Bramford to Braintree circuits to the new substation. This may require the substation location to be re-considered altogether with additional cost and complexity to this proposal.

15.3.7 Both the re-design and additional circuit turn-in would cause delays in consequence to the Bramford to Twinstead project would lead to significant constraint cost increases borne by consumers in the order of £500m or greater.

15.4 Cost considerations

15.4.1 Table 15.4 below provides a comparison of options based on the most economical technology choice for each option (i.e. AC OHL for onshore options; HVDC for Offshore 1).

Table 15.4 – Cost Summary of combination of works required to meet project need

Boundary or Group	Onshore Options				Offshore
EC5N & EC3	EAN 1 Necton to Pelham	EAN 2 Necton to Twinstead	EAN 3 Necton to Bramford	EAN 4 Norwich Main to Bramford	Offshore 1 Norwich Main to Tilbury
Economic Technology (Capacity)	OHL 115km (6930 MW)	OHL 90km (6930 MW)	OHL 85km (6930 MW)	OHL 80km (6930 MW)	
Capital Cost including non-circuit works	£494.5m	£494.2m	£375.1m	£355.2m	
Circuit 40yr Lifetime NPV Cost	£787m	£616m	£582m	£548m	
EC5 & LE1	EAS 1 Twinstead to Tilbury	EAS 2 Bramford via new substation to Tilbury	EAS 3 Bramford via Bradwell to Tilbury		
Economic Technology (Capacity)	OHL 80km (6930 MW)	OHL 100km (6930 MW)	OHL 130km (6930 MW)		HVDC 220km (6000 MW) [4000 MW]
Capital Cost including non-circuit works	£454.4m	£539.3m	£658.7m		£4,096.5 [£2,882.4m]
Circuit 40yr Lifetime NPV Cost	£548m	£684m	£890m		£4,661m [£3,232m]
SC2, EC5, LE1 & Sizewell	Sea Link Sizewell area to Richborough area				
Economic Technology (Capacity)	HVDC 145km 2000 MW				
Capital Cost including non-circuit works	£1,420.8m				
Circuit 40yr Lifetime NPV Cost	£1,197m				

15.4.2 To meet the need case of providing 9,225 MW across EC5 , both the AC onshore options (with a capacity of 6,930 MW) and HVDC option Offshore 1 (6,000 MW) would meet the need set out earlier in this document in combination with the 2,000 MW SCD1/Sea Link or an equivalent along with power flow control to manage 300MW shortfall. A 4000 MW HVDC option was included for completeness based upon earlier contracted backgrounds which are no longer current and no longer meet the need.

15.4.3 The lowest overall onshore cost combination to meet the need as indicated in Table 15.4 is:

- EAN 4 – Norwich Main to Bramford with capital costs of £355m and Circuit Lifetime Costs of £548m; and
- EAS 1 – Twinstead to Tilbury with a capital costs of £454m and Circuit Lifetime Costs of £547m.

15.4.4 The total capital cost would therefore be £809m, with circuit lifetime cost of £1,095m.

15.4.5 However, only the EAS 1 option facilitates the contracted Essex Cost Generation Group including Tarchon Interconnector, North Falls and Five Estuary offshore wind generation, with a combined capacity of 3580 MW, with the significant cost of bringing these coastal connections much further inland and providing connections at a new Twinstead substation.

15.4.6 The EAS 1 option also does not easily facilitate any future coastal generation and interconnector connections for which solutions providing >6000 MW capacity could accommodate by their inherent additional capacity to support delivering net zero by 2050.

15.4.7 As mentioned above, of the southern onshore options, only EAS 2 and EAS 3 provide the ability to the contracted Essex Cost Generation Group including Tarchon Interconnector, North Falls and Five Estuary offshore wind generation by allowing for a new coastal substation.

15.4.8 EAS 1 would result in additional costs of £500m or greater, to carry out the necessary transmission connection works for the interconnectors and generators to connect much further from the coast. This cost would be significantly greater than the £85m capital differential to the next least cost option southern onshore option (EAS 2), which includes the cost for a new substation for these generation connections.

15.4.9 Option EAS1 would require rebuilding of Twinstead substation and depending on the northern option selected would require the turn-in of Bramford-Braintree circuits into Twinstead.

15.4.10 These factors make EAS1 less optimal from a technical perspective and additional costs both in delays of existing projects and additional customer connection costs would make the overall cost impact of this option less favourable as well as the need for a significantly large new substation to be constructed.

15.4.11 Therefore, taking into account environmental, socio-economic, net zero government obligations, technical and cost perspectives, the optimal overall onshore combination to meet the need and facilitate the contracted Essex Cost Generation Group including Tarchon Interconnector, North Falls and Five Estuary offshore wind generation is:

- EAN 4 – Norwich Main to Bramford with capital costs of £355m and Circuit Lifetime Costs of £548m; and
- EAS 2 – Bramford via a new coastal substation to Tilbury with capital costs of £539.3m and Circuit Lifetime Costs of £684m.

15.4.12 The total capital costs would therefore be £894m, with Circuit Lifetime Costs of £1,232m.

15.4.13 Although it would be challenging to avoid altogether impacts on the Dedham Vale AONB as a result of EAS 2, this is not considered to be inconsistent with policy in the two relevant NPSs as outlined above. If routeing to avoid the AONB is not considered viable, it would be possible to use underground cables, as anticipated in Government policy.

15.4.14 Originally, the lowest cost offshore alternative option to meet the need was option Offshore 1 (Norwich Main to Tilbury) at 4000 MW with capital costs £2,882.2m and Circuit Lifetime Costs of £3,232m, in combination with SCD1/Sea Link or an alternative. However, this option no longer provides the required capacity of a minimum of 8,000 MW across LE1 and EC5, since the updated contracted generation described in the needs case section of this report has increased. This option has been included in this report as it was considered when the contracted position allowed and disclosed previously. Option Offshore 1 is also suboptimal in technical terms relative to the optimal onshore combination of options (EAN 4 and EAN 2).

15.4.15 The offshore alternative to match the capacity of AC onshore options is a Norwich Main to Tilbury 6000 MW option, which, when combined with Sea Link, would meet the requirements of delivering 8,000 MW across EC5 and LE1 by 2050. The capital costs would be £4,097m and Circuit Lifetime Costs £4,661m, significantly in excess of the costs of onshore combinations. Option Offshore 1 is also suboptimal in technical terms relative to the optimal onshore combination of options (EAN 4 and EAN 2).

15.4.16 As noted above, the 6,000 MW Offshore Option 1 would facilitate the connection of the contracted Essex Cost Generation Group including Tarchon Interconnector, North Falls and Five Estuary offshore wind generation with a combined capacity of 3,580MW. However, to make an offshore connection into the link would require the additional cost of HVDC converter station, AC substation, offshore HVDC platform, Offshore AC platform with an additional capital cost of greater than £500m.

15.4.17 Offshore options do not provide the flexibility of onshore connection options which facilitate flows both to the West and East of the transmission system for different system faults. Offshore 1 only provides flows to the East of London, whereas energy demand is distributed throughout England so this option would not be as effective for all system conditions compared with the combination of an EAN and EAS option.

15.4.18 Furthermore, the Offshore 1 option would not provide comparable capability to the AC onshore combinations. To achieve a fully like-for-like alternative with the AC North and South of East Anglia circuit options, with the additional flexibility of connecting into Bramford or substations to the west, the HVDC solution would need to be of a multi-terminal design, with 3 additional 2000 MW converters located at Bramford and cabling 50km from a DC bussing point offshore. This would significantly increase the costs and the potential environmental effects.

16. Interaction with other projects

16.1.1 As stated in Section 6, Strategic Options Overview, a further consideration NGET is currently evaluating is the interaction of both onshore and offshore options with Sea Link (SCD1). Sea Link is a 2000 MW HVDC connection from Sizewell to Richborough, with a proceed signal and 'HND critical' status in the NOA process.

16.1.2 Sea Link will be subject to its own full strategic options appraisal process. However, the presence or otherwise of a 2000 MW connection in the Sizewell area has a significant impact upon what is required to be built in the East Anglia region. For instance, if Sea Link, or an alternative with similar capacity, does not connect in the Sizewell area, there would be a requirement for additional infrastructure to accommodate the needs of the Sizewell generation group, as identified in Section 3.

16.1.3 Due to the interrelation between these projects, this report has undertaken an interactivity assessment of Sea Link.

16.1.4 This interactivity assessment sets out a comparison of the Sea Link options compared with the costs for an OHL providing the solution to the same need case.

16.1.5 This interactivity assessment also aims to present how the interaction of Sea Link and the strategic options set out in this report can impact upon the required amount of infrastructure needed in the immediate future.

16.1.6 Technical analysis of Interaction with Sea Link is as follows:

16.2 Technical scope and costs

16.2.1 As point of comparison to resolve the specific interconnector transfer requirements Sea Link HVDC option only requires 2000 MW of capacity. The AC onshore options would require a minimum of Med Capacity 6380MVA as AC flows cannot be controlled and more power will flow down these circuits under certain conditions. The AC subsea cable will therefore use this Med Capacity and for a point of comparison the onshore AC OHL required to allow the transfer between Sizewell and Canterbury 265km has also been included.

a) 400kV Overhead line

b) 400 kV AC Subsea cable

c) 525 kV high voltage direct current (HVDC) underground cable and converter stations

16.2.2 The interactive Sea Link project requires the following transmission works to satisfy the requirements of the SQSS.

- **New circuit requirements**
  - AC connections options use hi-capacity double circuits (two 400 kV AC circuits) with a total capacity of up to 6380 mega volt amperes (MVA) or;

- HVDC using 525 kV 2000 MW voltage source link, which would require a convertor station at each end similar in size to a large warehouse. A 2000 MW connection would require one convertor stations at each end, this is to provide the identified interactive need between East Anglia and Kent transmissions Systems

- **Substation works**
  - Substation connections to Friston/Sizewell
  - Remote HVDC Convertor Connection Cost (HVDC only)
  - Connection to New Substation between Richborough and Canterbury, along with associated circuit uprating works

Figure 16.1 – Option Sea Link Sizewell to Richborough

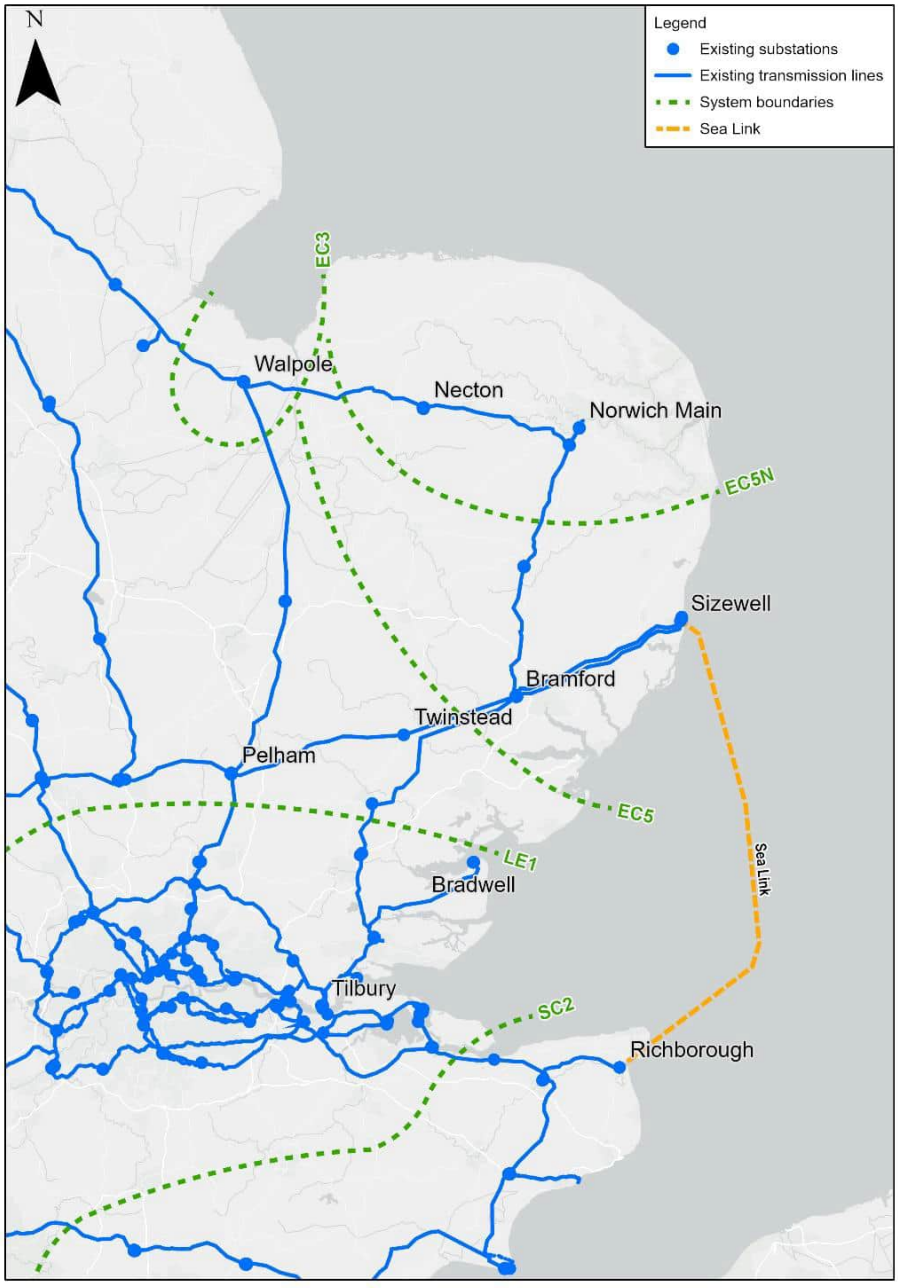


Table 16.1 below sets out the capital costs to show comparison of interactive Sea Link scheme compared to an onshore alternative considering substation works and each technology option.

Table 16.1 – capital costs of Sea Link options

Item	Need	Sea Link Interaction Capital Cost		
Substation Works	Facilitate generation and connect new circuits	£160m		£438.4m
New Circuits		**AC Onshore OHL**	**AC Subsea Cable**	**Offshore HVDC**
New Circuit Subsea 145km Onshore 165km	New Circuit across EC5 and LE1	£964.6m	£4,406.4m	£982.4m
Total Capital Cost		**£4,566.4m**	**£4,566.4m**	**£1,420.8m**

16.2.3 Table 16.2 below sets out the Circuit Lifetime Cost for the new circuit options, the Circuit Lifetime Costs are different for each circuit technology and are included as a differentiator between technologies. These costs are calculated using the methodology described in Appendix D.

Table 16.2 – Circuit Lifetime Costs of Sea Link options

Land Based option	AC Onshore OHL	AC Subsea Cable	HVDC
Capital Cost of New Circuits	£964.6m	£4,406.4m	£982.4m
NPV of cost of losses over 40 years	£828.1m	£280.2m	£157.1m
NPV of operation & maintenance costs over 40 years	£15.5m	£25.3m	£57.5m
Circuit Lifetime Cost of new circuits	**£1,808m**	**£4,712m**	£1,197m

16.2.4 The interactivity assessment of Sea Link shows that for an onshore option in this case to deliver the same system requirements as the proposed HVDC option, the capital costs would be closely equivalent and the Circuit Lifetime Cost of the onshore option would be significantly higher.

16.2.5 The onshore option also will have to not only approach urban areas of London where construction would be complex but would also have to cross the River Thames at a wide part of the Estuary. This would add significant cost to this option as such a crossing would likely require a cable tunnel with the additional cost of cable and tunnel excavation.

16.2.6 Therefore, whilst Sea Link has been subject to a separate strategic options exercise and Strategic Option Report published October 2023, the outcome of the interactivity assessment is a provisional recommendation that the assumption that Sea Link (or an equivalent) will provide 2000 MW of offshore capacity to Sizewell – as per the conclusions of the CPRSS – is sound for the purposes of this Strategic Options Backcheck and Review exercise.

17. Conclusion and next steps

17.1 Interim conclusions

17.1.1 As explained in Section 2, we have a key role providing a transmission system which benefits all consumers in England and Wales. Where new network infrastructure is needed, we must work within the regulatory, legislative and policy framework that is set by government on behalf of consumers and society in developing proposals. That means considering the various benefits and impacts that our potential works could have, including environmental, socio-economic, technical and cost factors.

17.1.2 This report has considered options to meet the Need Case set out in Section 4. A requirement has been identified for two sets of transmission circuits that contribute to National Electricity Transmission System (NETS) Security and Quality of Supply Standard (SQSS) compliance.

17.1.3 We have considered the information which is available to us at this stage of the process. We have outlined in this report how we have gathered data and how we have evaluated it for each option. In addition to this, we have also considered our duties under the Electricity Act 1989 to develop efficient, co-ordinated and economical solutions, our duty to have regard to the environment in Schedule 9 of the 1989 Act, and the policy, advice and guidance provided by Government through the revised National Policy Statements EN-1, EN-3 and EN-5.

17.1.4 Taking all of this into account, to meet the need to increase capacity across boundaries EC5N, EC5, LE1, SC2 and provide the required capacity for the Sizewell and Essex Coast Generation Groups, we propose at the current stage to take forward an interim preference of the onshore combination of **EAN 4 OHL Norwich Main to Bramford** and **EAS 2 OHL Bramford via a new substation to Tilbury**, alongside SCD1/Sea Link or an alternative connection from Sizewell area to north Kent. We will continue to review our work including in light of changes in circumstances and we will have regard to consultation responses.

17.1.5 This would meet the urgent and critical need to increase capacity across boundaries EC3, EC5N, EC5, LE1 and SC2. As well as providing the required capacity for the Sizewell and Essex Coast Generation Groups. We will continue to review our work including in light of changes in circumstances and we will have regard to consultation responses.

17.1.6 The interim preference onshore combination of EAN 4, EAS 2 and Sea Link resolves the needs case set out below.

- Provision of 9,225 MW of capacity across East Anglia EC5 Boundary and 4,931 MW of capacity across EC5N Boundary.
- Provision of 7,476 MW of capacity across the LE1 Boundary.
- Provision of 1,852 MW from the Sizewell Generation Group.
- Provision of 3,480 MW of connection capacity for the Essex Coast Generation Group
- Provision of 1,800 MW of capacity from the SC2 Boundary Group.

17.1.7 The project was formerly known as East Anglia Green Energy Enablement (GREEN). We've changed the name to Norwich to Tilbury make it clear that this project is part of The Great Grid Upgrade, the largest overhaul of the grid in generations.

17.2 Next steps

17.2.1 Norwich to Tilbury will now be taken forward to the next stage of development, statutory consultation, to seek feedback from consultees and help shape the further development of the projects prior to an application for a Development Consent Order being made in 2025.

17.2.2 More detailed analysis for SCD1 Sea Link will be carried out separately and will come forward for consultation in in due course.

Appendices

Appendix A: Summary of National Grid Electricity Transmission legal obligations

Appendix B: Requirement for development consent

Appendix C: Technology overview

Appendix D: Economic appraisal

Appendix E: Mathematical principles used for AC loss calculation

Appendix F: Glossary of terms and acronyms

Appendix G: Appraisal study areas

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Appendix A
Summary of National Grid Electricity Transmission Legal Obligations

A.1 Electricity Transmission Licence

A.1.1 The Electricity Act 1989 (the 'Electricity Act') defines transmission of electricity within GB and its offshore waters, as a prohibited activity, which cannot be carried out without permission by a transmission licence granted under Section 6(1)(b) of the Electricity Act (a 'Transmission Licence').

A.1.2 National Grid Electricity Transmission ('National Grid') has been granted a Transmission Licence that permits transmission owner activities in respect of the electricity transmission system National Grid owns, develops and maintains in England and Wales.

A.1.3 Each Transmission Licence includes conditions which define the scope of the permission granted to carry out a prohibited activity in terms of duties, obligations, restrictions and rights. The generic conditions that apply to any holder of a Transmission Owner licence type are set out in Sections A, B and D of the Standard Conditions of the Transmission Licence. Conditions that only apply to a specific licensee are set out as Special Conditions of that Transmission Licence.

A.1.4 National Grid is therefore bound by the legal obligations primarily set out in the Electricity Act and its Transmission Licence. The following list provides a summary overview of requirements that are considered when developing proposals to construct new transmission system infrastructure.

A.2 Electricity Act Duties

A.2.1 In accordance with Section 9 of the Electricity Act, National Grid is required to develop and maintain an efficient, coordinated and economical system of electricity transmission.

A.2.2 Schedule 9 of the Electricity Act requires 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 to 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".

A.2.3 National Grid's Stakeholder, Community and Amenity Policy ('the Policy') sets out how the company will meet this Schedule 9 duty. The commitments within the Policy include:

- only seeking to build new lines and substations where the existing transmission infrastructure cannot be upgraded technically or economically to meet transmission security standards;
- where new infrastructure is required, seeking to avoid areas that are nationally or internationally designated for their landscape, wildlife or cultural significance, and
- minimising the effects of new infrastructure on other sites valued for their amenity.

A.2.4 The Policy also refers to the application of best practice methods to assess the environmental impacts of proposals and identify appropriate mitigation and/or offsetting measures. Effective consultation with stakeholders and the public is also promoted by the Policy.

A.3 National Grid's Transmission Licence Requirements

A.3.1 Condition B12: System Operator – Transmission Owner Code

All Transmission Licensees are required to have the System Operator Transmission Owner Code ('STC') in place that defines the arrangements within the transmission sector and sets out how the transmission system operator can access and use transmission services provided by transmission owners.

The STC structure aligns with key activities within the transmission sector including:

- Planning Co-ordination (of transmission system development works and construction);
- Provision of transmission services within different operational timescales, and
- Payments from transmission system operator to providers of transmission services (after service has been delivered).

A.3.2 Condition B16: Electricity Network Innovation Strategy

All Transmission Licensees are required to have a joined-up approach to innovation and develop an Electricity Network Innovation Strategy that is reviewed every two years.

A.3.3 Condition D2: Obligation to provide transmission services

Each transmission owner is required to provide transmission services to the transmission system operator as defined in the STC. Transmission services provided to the transmission system operator include:

- enabling use to be made of existing transmission owner assets, and
- responding to requests for the construction of additional transmission system capacity (including system extension, disconnections and/or reinforcement).

A.3.4 Condition D3: Transmission system security standard and quality of service

Transmission owners are required to at all times plan, develop the transmission system in accordance with the National Electricity Transmission System Security and Quality of Supply Standard ('NETS SQSS').

A transmission owner with supporting evidence, may ask the Authority to grant derogation from the requirements set out in the NETS SQSS. Any decision in respect of NETS SQSS derogations are subject to the Authority's consideration of all relevant factors.

A.3.5 Condition D17: Whole Electricity System Obligations

Transmission owners are required to coordinate and cooperate with Transmission Licensees and electricity distributors in order to build common understanding of where actions taken by one could have cross-network impacts. A transmission owner should implement actions or processes that are identified that:

- will not have a negative impact on its network, and
- are in the interest of the efficient and economical operation of the total system.

Appendix B
Requirement for Development Consent Order

B.1 Electricity Network Infrastructure Developments

B.1.1 Developing the electricity transmission system in England and Wales subject to the type and scale of the project, may require one or more statutory consents which may include:

- planning permission under the Town and Country Planning Act 1990;
- a marine licence under the Marine and Coastal Access Act 2009;
- a Development Consent Order ("DCO") under the Planning Act 2008, and/or
- a variety of consents under related legislation.

B.1.2 The Planning Act 2008 defines developments of new electricity overhead lines of 132kV and above as Nationally Significant Infrastructure Projects ('NSIPs') requiring a DCO. Such an order may also incorporate Consent for other types of work that is associated with new overhead line infrastructure development, may be incorporated as part of a DCO that is granted.

B.1.3 Five National Policy Statements ("NPS") for energy infrastructure were designated by the Secretary of State for Energy and Climate Change in November 2023 and confirmed by parliament in January 2024. The relevant NPSs for electricity transmission infrastructure developments are the Overarching National Policy Statement for Energy (EN-1) and the National Policy Statement for Electricity Networks Infrastructure (EN-5), which is read in conjunction with EN-1. The current nuclear National Policy Statement (NPS), EN-6, was published in 2011 and provides a framework for assessing development consent applications for new nuclear power stations expected to deploy by the end of 2025.

B.1.4 Section 104(3) of the Planning Act 2008 states that the decision maker must determine an application for a DCO in accordance with any relevant NPS, except in certain specified circumstances (such as where the adverse impact of the proposed development would outweigh its benefits). The energy NPSs therefore provide the primary policy basis for decisions on DCO applications for electricity transmission projects. The NPSs may also be a material consideration for decisions on other types of development consent in England and Wales (including offshore wind generation projects) and for planning applications under the Town and Country Planning Act 1990.

B.2 Demonstrating the Need for a Project

B.2.1 Part 3 of EN-1 sets out Government policy on the need for new nationally significant energy infrastructure ////projects. Paragraph 3.3.1 states that electricity meets a significant proportion of our overall energy needs and our reliance on it will increase as we transition the energy system to deliver net zero.

B.2.2 3.3.4 states that there are several different types of electricity infrastructure that are needed to deliver the UK's energy objectives. These include "Additional generating plants, electricity storage, interconnectors and electricity networks all have a role, but none of them will enable us to meet thes objectives in isolation."

B.2.3 Description of the need for:

- new electricity transmission infrastructure is set out in EN-1 and EN-5
- new offshore/onshore wind generation is set out in EN-1 and EN-3, and
- new nuclear generation is set out in EN-1 and EN-6 (2011).

B.2.4 The need for new transmission infrastructure for this project is described in section 3 of this Report.

B.3 Assessment Principles Applied by Decision Maker

B.3.1 Part 4 of EN-1 sets out the general policies that are applied in determining DCO applications relating to new energy infrastructure. -Section 2.9 EN-5 set out the general assessment principles in the specific context of electricity networks infrastructure.

B.3.2 Principles of particular importance for transmission infrastructure projects include:

B.3.3 Presumption in Favour of Development

- Section 4.1 of EN-1 states that given the level and urgency of need for infrastructure (of the types covered by EN-1), the Secretary of State will start r with a presumption in favour of granting consent for energy NSIPs. This presumption applies unless any more specific and relevant policies set out in the relevant NPS clearly indicate that consent should be refused. The presumption is also subject to the exceptions set out in Section 104(2) of the Planning Act 2008.
- In assessing any application, the Secretary of State should take account of potential:
  - benefits (e.g. the contribution to meeting the need for energy infrastructure, job creation and long-term or wider benefits), and
  - adverse impacts (e.g. long term and cumulative impacts but taking into account proposed mitigation measures.

B.3.4 Consideration of Alternatives

- Section 4.3 of EN-1 states that, as in any planning case, the relevance or otherwise to the decision making process of the existence (or alleged existence) of alternatives to the proposed development is, in the first instance, a matter of law. NPS EN-1 does not contain any general requirement to consider alternatives or to establish whether the proposed project represents the best option from a policy perspective. However, in relation to electricity transmission projects, paragraph 29.14 of EN-5 states that, "where the nature or proposed route of an overhead line proposal makes it likely that its landscape and visual impacts will be particularly significant, the applicant should have given appropriate consideration to the potential costs and benefits of other feasible means of connection or reinforcement, including underground and subsea cables where appropriate."
- Section 4.3 of EN-1 also makes clear that there will be circumstances where an applicant is specifically required to include information in their application about the main alternatives that were considered. These circumstances may include requirements under the Habitats Directive and the Birds Directive[7] and requirements in relation to compulsory acquisition.

B.3.5 Adverse Impacts and Potential Benefits

- Part 5 of EN-1 covers the impacts that are common across all energy NSIPs and section 2.- of EN-5 consider impact in the specific context of electricity networks infrastructure.
- Those impacts identified in EN-1 include air quality and emissions, biodiversity and geological conservation, civil and military aviation and defence interests, coastal

[7] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora; Council Directive 2009/147/EC on the conservation of wild birds.

change (to the extent in or proximate to a coastal area), dust, odour, artificial light, smoke, steam and insect infestation, flood risk, historic environment, landscape and visual, land use, noise and vibration, socio-economic effects, traffic and transport, waste management and water quality and resources. The extent to which these impacts are relevant to a particular stage of a project, or are a relevant differentiator at a particular stage of the options appraisal process, will vary. In particular, some of these impacts are scoped out of this stage of the options appraisal process for this project. EN-5 considers specific potential impacts of electricity networks on biodiversity and geological conservation, landscape and visual, noise and vibration, and electric and magnetic fields.

- Potential impacts of particular importance for electricity transmission infrastructure projects include:

B.3.6 Good Design

- Section 4.7 of EN-1 stresses the importance of 'good design' for energy infrastructure, explaining that this goes beyond aesthetic considerations as fitness for purpose and sustainability are equally important. It is acknowledged in EN-1 that the nature of much energy infrastructure development will often limit the extent to which it can contribute to the enhancement of the quality of the area. Section 2.4 of EN-5 identifies a particular need for the applicant to demonstrate the principles of good design were applied in the proposed approach to mitigating the potential adverse impacts which can be associated with overhead lines.

B.3.7 Climate Change

- Section 4.10 of EN-1 explains how the effects of climate change should be taken into account and section 2.3 of EN-5 expands on this in the specific context of electricity networks infrastructure. DCO applications are required to set out the vulnerabilities / resilience of the proposals to flooding, effects of wind and storms on overhead lines, higher average temperatures leading to increased transmission losses and earth movement or subsidence caused by flooding or drought (for underground cables).

B.3.8 Holistic Planning

- Section 4.10 of EN1 and Section 2.7 of EN-5 explains that the Planning Act 2008 aims to create a holistic planning regime, such that the cumulative effects of the same project can be considered together. Accordingly, the government envisages that, wherever reasonably possible, applications for new generating stations and their related infrastructure should be contained in a single application. Paragraph 2.7.2 goes onto state that a consolidated approach of this kind may not always be possible, nor represent the most efficient strategy for delivery of new infrastructure. -.

B.3.9 Electricity Act Duties

- Paragraph 2.2.10 of EN-5 recognises developers' duties pursuant to section 9 of the Electricity Act to bring forward efficient and economical proposals in terms of network design. Paragraph 2.8.5 sets out that transmission operators (and Distribution Network Operators) are also required to facilitate competition and so provide a connection where requested.

B.3.10 Adverse Impacts and Potential Benefits

- Part 5 of EN-1 covers the impacts that are common across all energy NSIPs and section2.-9 of EN-5 consider impact in the specific context of electricity networks infrastructure.
- Those impacts identified in EN-1 include air quality and emissions, biodiversity and geological conservation, civil and military aviation and defence interests, coastal change (to the extent in or proximate to a coastal area), dust, odour, artificial light, smoke, steam and insect infestation, flood risk, historic environment, landscape and visual, land use, noise and vibration, socio-economic effects, traffic and transport, waste management and water quality and resources. The extent to which these impacts are relevant to a particular stage of a project, or are a relevant differentiator at a particular stage of the options appraisal process, will vary. In particular, some of these impacts are scoped out of this stage of the options appraisal process for this project. EN-5 considers specific potential impacts of electricity networks on biodiversity and geological conservation, landscape and visual, noise and vibration, and electric and magnetic fields.
- Potential impacts of particular importance for electricity transmission infrastructure projects include:
  - Landscape and Visual

    Paragraph 2.9.7 of EN-5 states that the Government does not believe that development of overhead lines is generally incompatible in principle with the developer statutory duty under Schedule 9 to the Electricity Act 1989, to have regard to visual and landscape amenity and to reasonably mitigate possible impacts thereon. However, EN-5 recognises that in practice overhead lines can give rise to adverse landscape and visual impacts, dependent upon their scale, siting, degree of screening and the nature of the landscape and local environment through which they are routed.

    In relation to undergrounding and subsea cables, paragraph 2.9.20 states “Although it is the government’s position that overhead lines should be the strong starting presumption for electricity networks developments in general, this presumption is reversed when proposed developments will cross part of a nationally designated landscape (i.e. National Park, The Broads, or Areas of Outstanding Natural Beauty.” However, paragraph 2.9.22 goes onto state that undergrounding will not be required where it is infeasible in engineering terms, or where the harm that it causes is out outweighed by its corresponding landscape, visual amenity and natural beauty benefits. -Taking account of the fact that Government has not laid down any further rule on the circumstances requiring the use of underground or subsea cables, the Secretary of State much weigh the feasibility, cost, and any harm of the undergrounding or subsea option against:
- The adverse implications of the overhead line proposal;
- The cost and feasibility of re-reouting;
- Cost and feasibility of the reconfiguration, rationalisation, and/or use of underground or subsea cabling of proximate existing or proposed electricity network infrastructure.
  - Paragraph 2.9.17 of EN-5 endorses the Holford Rules which are a set of "common sense" guidelines for routeing new overhead lines.

Appendix C
Technology Overview

C.1.1 This section provides an overview of the technologies available when the strategic options described in this Report were identified. It provides a high-level description of the relevant features of each technology. The costs for each technology are presented in Appendix D.

C.1.2 The majority of electricity systems throughout the world are AC systems. Consumers have their electricity supplied at different voltages depending upon the amount of power they consume e.g. 230V for domestic customers and 11 kV for large factories and hospitals. The voltage level is relatively easy to change when using AC electricity, which means a more economical electricity network can be developed for customer requirement. This has meant that the electrification of whole countries could be and was delivered quickly and efficiently using AC technology.

C.1.3 DC electricity did not develop as the means of transmitting large amounts of power from generating stations to customers because DC is difficult to transform to a higher voltage and bulk transmission by low voltage DC is only effective for transporting power over short distances. However, DC is appropriate in certain applications such as the extension of an existing AC system or when providing a connection to the transmission system.

C.1.4 In terms of voltage, the transmission system in England and Wales operates at both 275 kV and 400 kV. The majority of National Grid's transmission system is now constructed and operated at 400 kV, which facilitates higher power transfers and lower transmission losses.

C.1.5 There are a number of different technologies that can be used to provide transmission connections. These technologies have different features which affect how, when and where they can be used. The main technology options for electricity transmission are:

- Overhead lines
- Underground cables
- Gas Insulated Lines ("GIL"), and
- High Voltage Direct Current (HVDC).

C.1.6 This appendix provides generic information about each of these four technologies. Further information, including a more detailed technical review is available in a series of factsheets that can be found at the [redacted]referenced at the beginning of this Report.

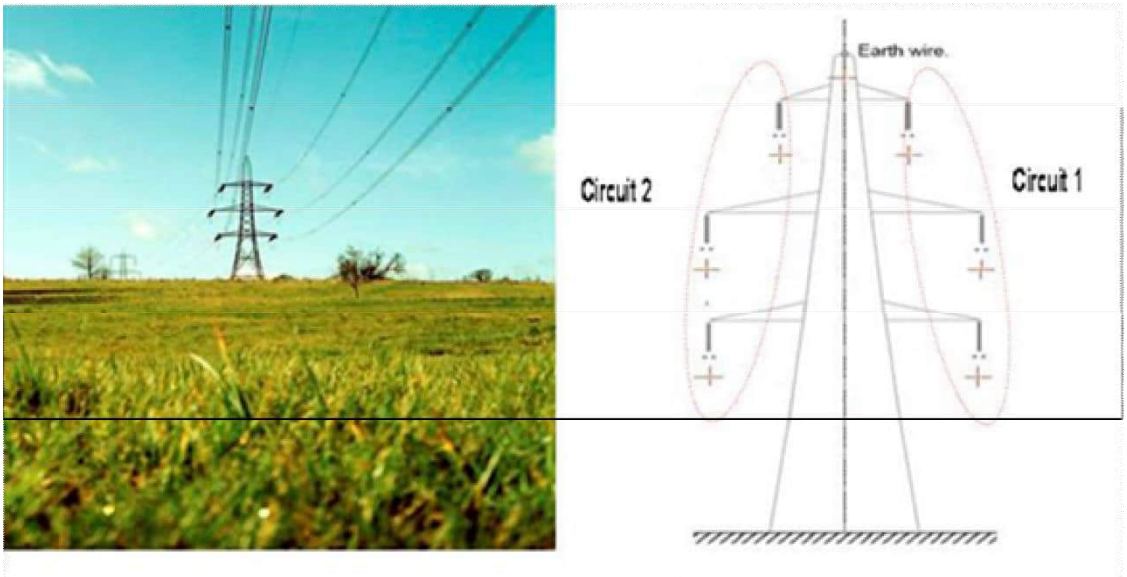
C.2 Overhead lines

C.2.1 Overhead lines form the majority of the existing transmission system circuits in Great Britain and in transmission systems across the world. As such there is established understanding of their construction and use.

C.2.2 Overhead lines are made up of three main component parts which are; conductors (used to transport the power), pylons (used to support the conductors) and insulators (used to safely connect the conductors to pylons).

C.2.3 Figure C.1 shows a typical pylon used to support two 275 kV or 400 kV overhead line circuits. This type of pylon has six arms (three either side), each carrying a set (or bundle) of conductors.

Figure C.1 – Example of a 400 kV Double-circuit Tower



C.2.4 The number of conductors supported by each arm depends on the amount of power to be transmitted and will be either two, three or four conductors per arm. Technology developments have increased the capacity that can be carried by a single conductor and therefore, new overhead lines tend to have two or three conductors per arm.

C.2.5 With the conclusion of the Royal Institute of British Architects (RIBA) pylon design competition[8] and other recent work with manufacturers to develop alternative pylon designs, National Grid is now able to consider a broader range of pylon types, including steel lattice and monopole designs. The height and width is different for each pylon type, which may help National Grid to manage the impact on landscape and visual amenity better. Figure C.2, below, shows an image on the monopole design called the T-pylon that was developed by National Grid.

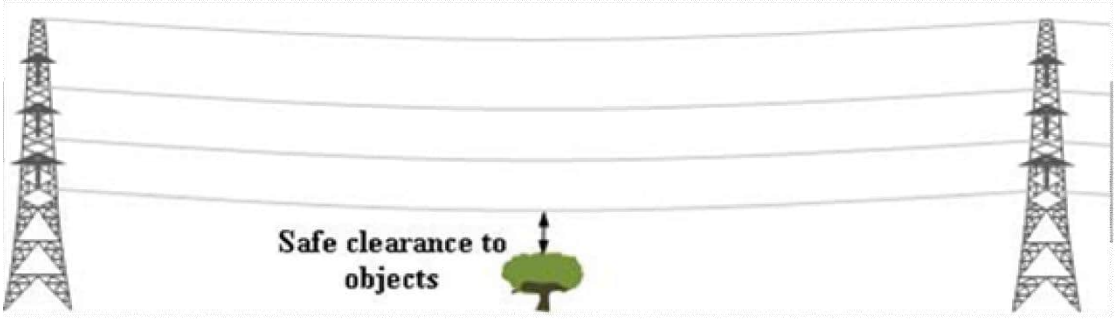
[8] Pylon Design an RIBA competition, https://www.architecture.com/awards-and-competitions-landing-page/competitions-landing-page/pylon

Figure C.2 – The T-pylon



C.2.6 Pylons are designed with sufficient height to ensure that the clearances between each conductor and between the lowest conductor and the ground, buildings or structures are adequate to prevent electricity jumping across. The minimum clearance between the lowest conductor and the ground is normally at the mid-point between pylons. There must be sufficient clearance between objects and the lowest point of the conductor as shown in Figure C.3.

Figure C.3 – Safe height between lowest point of conductor and other obstacle ("Safe Clearance")



C.2.7 The distance between adjacent pylons is termed the 'span length'. The span length is governed by a number of factors, the principal ones being pylon height, number and size of conductors (i.e. weight), ground contours and changes in route direction. A balance must therefore be struck between the size and physical presence of each tower versus the number of towers; this is a decision based on both visual and economic aspects. The typical 'standard' span length used by National Grid is approximately 360m.

C.2.8 Lower voltages need less clearance and therefore the pylons needed to support 132 kV lines are not as high as traditional 400 kV and 275 kV pylons. However, lower voltage circuits are unable to transport the same levels of power as higher voltage circuits.

C.2.9 National Grid has established operational processes and procedures for the design, construction, operation and maintenance of overhead lines. Circuits must be taken out of service from time to time for repair and maintenance. However, shorter emergency

restoration times are achievable on overhead lines as compared, for example, to underground cables. This provides additional operational flexibility if circuits need to be rapidly returned to service to maintain a secure supply of electricity when, for example, another transmission circuit is taken out of service unexpectedly.

C.2.10 In addition, emergency pylons can be erected in relatively short timescales to bypass damaged sections and restore supplies. Overhead line maintenance and repair therefore does not significantly reduce security of supply risks to end consumers.

C.2.11 Each of the three main components that make up an overhead line has a different design life, which are:

- Between 40 and 50 years for overhead line conductors
- 80 years for pylons
- Between 20 and 40 years for insulators.

C.2.12 National Grid expects an initial design life of around 40 years, based on the specified design life of the component parts. However, pylons can be easily refurbished and so substantial pylon replacement works are not normally required at the end of the 40 year design life.

C.3 Underground Cables

C.3.1 Underground cables at 275 kV and 400 kV make up approximately 10% of the existing transmission system in England and Wales, which is typical of the proportion of underground to overhead equipment in transmission systems worldwide. Most of the underground cable is installed in urban areas where achieving an overhead route is not feasible. Examples of other situations where underground cables have been installed, in preference to overhead lines, include crossing rivers, passing close to or through parts of nationally designated landscape areas and preserving important views.

C.3.2 Underground cable systems are made up of two main components – the cable and connectors. Connectors can be cable joints, which connect a cable to another cable, or overhead line connectors in a substation.

C.3.3 Cables consist of an electrical conductor in the centre, which is usually copper or aluminium, surrounded by insulating material and sheaths of protective metal and plastic. The insulating material ensures that although the conductor is operating at a high voltage, the outside of the cable is at zero volts (and therefore safe). Figure C.4 shows a cross section of a transmission cable and a joint that is used to connect two underground cables.

Figure C.4 – Cable Cross-Section and Joint



C.3.4 Underground cables can be connected to above-ground electrical equipment at a substation, enclosed within a fenced compound. The connection point is referred to as a cable sealing end. Figure C.5 shows two examples of cable sealing end compounds.

Figure C.5 – Cable Sealing End Compounds



C.3.5 An electrical characteristic of a cable system is capacitance between the conductor and earth. Capacitance causes a continuous ‘charging current’ to flow, the magnitude of which is dependent on the length of the cable circuit (the longer the cable, the greater the charging current) and the operating voltage (the higher the voltage the greater the current). Charging currents have the effect of reducing the power transfer through the cable.

C.3.6 High cable capacitance also has the effect of increasing the voltage along the length of the circuit, reaching a peak at the remote end of the cable.

C.3.7 National Grid can reduce cable capacitance problems by connecting reactive compensation equipment to the cable, either at the ends of the cable, or, in the case of longer cables, at regular intervals along the route. Specific operational arrangements and switching facilities at points along the cable circuit may also be needed to manage charging currents.

C.3.8 Identifying faults in underground cable circuits often requires multiple excavations to locate the fault and some repairs require removal and installation of new cables, which can take a number of weeks to complete.

C.3.9 High voltage underground cables must be regularly taken out of service for maintenance and inspection and, should any faults be found and depending on whether cable excavation is required, emergency restoration for security of supply reasons typically takes a lot longer than for overhead lines (days rather than hours).

C.3.10 The installation of underground cables requires significant civil engineering works. These make the construction times for cables longer than overhead lines.

C.3.11 The construction swathe required for two AC circuits comprising two cables per phase will be between 35-50 m wide.

C.3.12 Each of the two main components that make up an underground cable system has a design life of between 40 and 50 years.

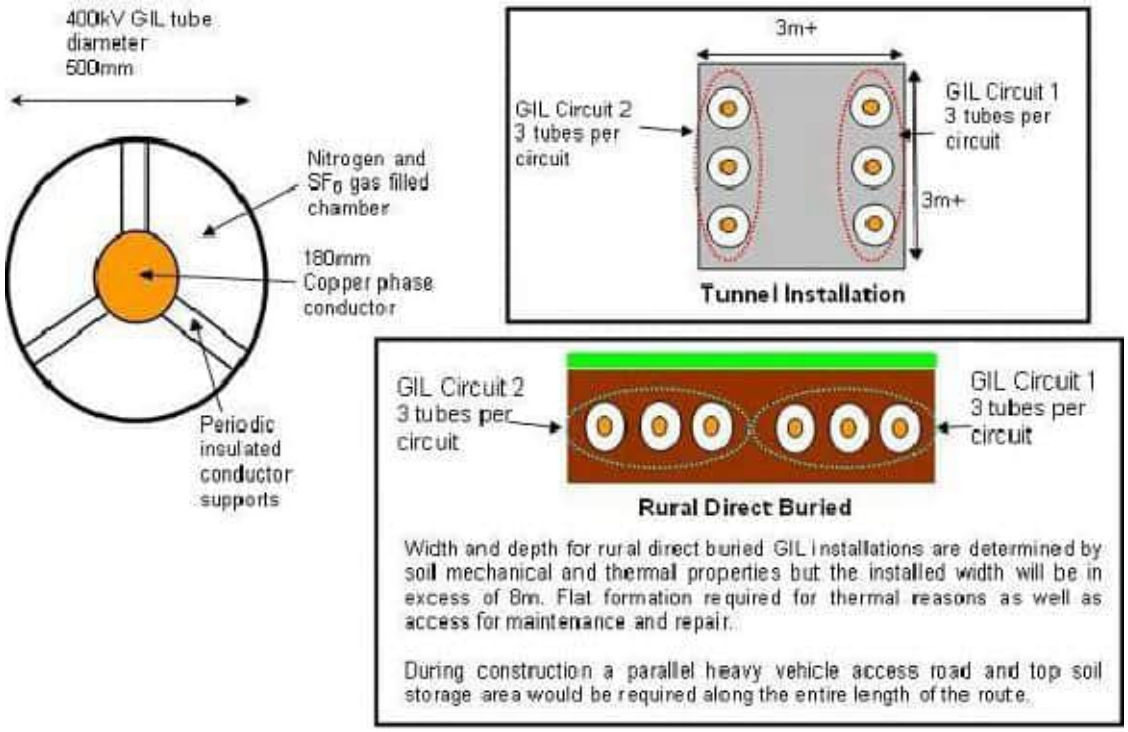
C.3.13 Asset replacement is generally expected at the end of design life. However, National Grid's asset replacement decisions (that are made at the end of design life) will also take account of actual asset condition and may lead to actual life being longer than the design life.

C.4 Gas Insulated Lines ("GIL")

C.4.1 GIL is an alternative to underground cable for high voltage transmission. GIL has been developed from the well-established technology of gas-insulated switchgear, which has been installed on the transmission system since the 1960s.

C.4.2 GIL uses a mixture of nitrogen and sulphur hexafluoride (SF6) gas to provide the electrical insulation. GIL is constructed from welded or flanged metal tubes with an aluminium conductor in the centre. Three tubes are required per circuit, one tube for each phase. Six tubes are therefore required for two circuits, as illustrated in Figure C.6 below.

Figure C.6 – Key Components of GIL



C.4.3 GIL tubes are brought to site in 10 – 20 m lengths and they are joined in situ. It is important that no impurities enter the tubes during construction as impurities can cause the gas insulation to fail. GIL installation methods are therefore more onerous than those used in, for example, natural gas pipeline installations.

C.4.4 A major advantage of GIL compared to underground cable is that it does not require reactive compensation.

C.4.5 The installation widths over the land can also be narrower than cable installations, especially where more than one cable per phase is required.

C.4.6 GIL can have a reliability advantage over cable in that it can be re-energised immediately after a fault (similar to overhead lines) whereas a cable requires investigations prior to re-energisation. If the fault was a transient fault it will remain energised and if the fault was permanent the circuit will automatically and safely de-energise again.

C.4.7 There are environmental concerns with GIL as the SF_6[9] gas used in the insulating gas mixture is a potent 'greenhouse gas'. Since SF6 is an essential part of the gas mixture GIL installations are designed to ensure that the risk of gas leakage is minimised.

C.4.8 There are a number of ways in which the risk of gas leakage from GIL can be managed, which include:

- use of high-integrity welded joints to connect sections of tube;
- designing the GIL tube to withstand an internal fault; and
- splitting each GIL tube into a number of smaller, discrete gas zones that can be independently monitored and controlled.

C.4.9 At decommissioning the SF_6 can be separated out from the gas mixture and either recycled or disposed of without any environmental damage.

C.4.10 GIL is a relatively new technology and therefore has limited historical data, meaning that its operational performance has not been empirically proven. National Grid has two GIL installations on the transmission system which are 545 m and 150 m long[10]. These are both in electricity substations; one is above ground and the other is in a trough. The longest directly buried transmission voltage GIL in the world is approximately one kilometre long and was recently installed on the German transmission system around Frankfurt Airport.

C.4.11 In the absence of proven design life information, and to promote consistency with assessment of other technology options, National Grid assesses GIL over a design life of up to 40 years.

C.5 High Voltage Direct Current ("HVDC")

C.5.1 HVDC technology can provide efficient solutions for the bulk transmission of electricity between AC electricity systems (or between points on an electricity system).

C.5.2 There are circumstances where HVDC has advantages over AC, generally where transmission takes place over very long distances or between different, electrically separate systems, such as between Great Britain and countries in Europe such as France, Belgium, The Netherlands, Ireland etc.…

C.5.3 HVDC links may also be used to connect a generating station that is distant from the rest of the electricity system. For example, very remote hydro-electric schemes in China are connected by HVDC technology with overhead lines.

[9] SF_6 is a greenhouse gas with a global warming potential, according to the Intergovernmental Panel on Climate Change, Working Group 1 (Climate Change 2007, Chapter 2.10.2), of 22,800 times that of CO2. www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html

[10] The distances are based on initial manufacturer estimates of tunnel and buried GIL dimensions which would be subject to full technical appraisal by National Grid and manufacturers to achieve required ratings which may increase the separation required. It should be noted that the diagram does not show the swathe of land required during construction. Any GIL tunnel installations would have to meet the detailed design requirements of National Grid for such installations.

C.5.4 Proposed offshore wind farms to be located over 60 km from the coast of Great Britain are likely to be connected using HVDC technology as an alternative to an AC subsea cable. This is because AC subsea cables over 60 km long have a number of technical limitations, such as high charging currents and the need for mid-point compensation equipment.

C.5.5 The connection point between AC and DC electrical systems has equipment that can convert AC to DC (and vice versa), known as a converter. The DC electricity is transmitted at high voltage between converter stations. Convertor stations can use two types of technology. “Classic” or Current Source Convertors (CSC) were the first type of HVDC technology developed and this design was used for National Grid’s Western Link. Voltage Source Convertors (VSC) are a newer design and offer advantages over the previous CSC convertors, as they can better support weaker systems and offer more flexibility in the way they operate, including direction of power flow.

Figure C.7 – VSC convertor Station



C.5.6 HVDC can offer advantages over AC underground cable, such as:

- a minimum of two cables per circuit is required for HVDC whereas a minimum of three cables per circuit is required for AC.
- reactive compensation mid-route is not required for HVDC.
- cables with smaller cross sectional areas can be used (compared to equivalent AC system rating).
- This allows HVDC cables to be more easily installed for subsea applications than AC cables for a given capacity.

C.5.7 HVDC cables are generally based upon two technology types Mass Impregnated and Extruded technologies. VSC technology may utilise either technology type, whereas CSC technology tends to be limited to Mass Impregnated cables due to the way poles are reversed for change of power flow direction.

Figure C.8 – HVDC Cable Laying Barge at transition between shore and sea cables



C.5.8 HVDC systems have a design life of about 40 years. This design life period is on the basis that large parts of the converter stations (valves and control systems) would be replaced after 20 years.

Appendix D
Economic Appraisal

D.1.1 As part of the economic appraisal of Strategic Options, National Grid makes comparative assessments of the Circuit Lifetime Costs associated with each technology option that is considered to be feasible.

D.1.2 This section provides an overview of the methods that National Grid uses to estimate Circuit Lifetime Costs as part the economic appraisal of a Strategic Option. It also provides a summary of generic capital cost information for transmission system circuits for each technology option included in Appendix C and an overview of the method that National Grid uses to assess the Net Present Value ("NPV") of costs that are expected to be incurred during the lifetime of new transmission assets.

The IET, PB/CCI Report[11] presents cost information in size of transmission circuit capacity categories for each circuit design that was considered as part of the independent study. To aid comparison between the cost data presented in the IET PB/CCI Report and that used by National Grid for appraisal of Strategic Options, this appendix includes cost estimates using National Grid cost data for circuit designs that are equivalent to those considered as part of the independent study. Examples in this Appendix are presented using the category size labels of "Lo", "Med" and "Hi" used in the IET PB/CCI Report.

D.2 Circuit Lifetime Costs for Transmission

D.2.1 For each technology option appraised within a Strategic Option, National Grid estimates total Circuit Lifetime Costs for the new transmission assets. The total Circuit Lifetime Cost estimate consists of the sum of the estimates of the:

- initial capital cost of developing, procuring, installing and commissioning the new transmission assets, and
- net present value ("NPV") of costs that are expected to be incurred during the lifetime of these new transmission assets

D.3 Capital Cost Estimates

D.3.1 At the initial appraisal stage, National Grid prepares indicative estimates of the capital costs. These indicative estimates are based on the high-level scope of works defined for each Strategic Option in respect of each technology option that is considered to be feasible. As these estimates are prepared before detailed design work has been carried out, National Grid takes account of equivalent assumptions for each option. Final project costs for any solution taken forward following detailed design and risk mitigation will be in excess of any high-level appraisal cost. However, all options would incur these increases in the development of a detailed solution.

D.3.2 This section considers the capital costs in two parts, firstly the AC technology costs are discussed, followed by HVDC technologies. Each of these technologies is described in Appendix C in more detail.

[11] "Electricity Transmission Costing Study – An Independent Report Endorsed by the Institution of Engineering & Technology" by Parsons Brinckerhoff in association with Cable Consulting International. Page 10 refers to Double circuit capacities https://www.theiet.org/media/9376/electricity-transmission-costing-study.pdf.

D.4 AC Technology Capital Cost Estimates

D.4.1 Table D.1 shows the category sizes that are relevant for AC technology circuit designs:

Table D.1 – AC Technology Circuit Designs

Category	Design	Rating
Lo	Two AC circuits of 1,595 MVA	3,190 MVA
Med	Two AC circuits of 3,190 MVA	6,380 MVA
Hi	Two AC circuits of 3,465 MVA	6,930 MVA

D.4.2 Table D.2 provides a summary of technology configuration and capital cost information (in financial year 2020/21 prices) for each of the AC technology options that National Grid considers as part of an appraisal of Strategic Options.

Table D.2 – AC Technology Configuration and National Grid Capital Costs by Rating

IET, PB/CCI Report short-form label	Circuit Ratings by Voltage		Technology Configuration			Capital Costs		
	275kV AC Technologies	400kV AC Technologies	Overhead Line (OHL)	AC Underground Cable (AC Cable)	Gas Insulated Line (GIL)	Overhead Line (OHL)	AC Underground Cable (AC Cable)	Gas Insulated Line (GIL)
	Total rating for two Circuits (2 x rating of each circuit)	Total rating for two Circuits (2 x rating of each circuit)	No. of Conductors Sets "bundles" on each arm/circuit of a pylon	No. of Cables per phase	No of direct buried GIL tubes per phase	Cost for a "double" two circuit pylon route (Cost per circuit, of a double circuit pylon route)	Cost for a two circuit AC cable route (Cost per circuit, of a two circuit AC cable route)	Cost for a two circuit GIL route (Cost per circuit, of a two circuit GIL route)
Lo	3190MVA (2 x 1595MVA) [2000MVA 2 x 1000MVA for AC Cable only]	3190MVA (2 x 1595MVA)	2 conductor sets per circuit (6 conductors per circuit)	1 Cable per Phase (3 cables per circuit)	1 tube per phase (3 standard GIL tubes per circuit)	£3.31m/km (£1.66m/km)	£16.35m/km (£8.17m/km)	£26.81m/km (£13.411m/km)
Med	N/A [3190MVA 2 x 1595MVA for AC Cable only]	6380MVA (2 x 3190MVA)	2 conductor sets per circuit (6 conductors per circuit)	2 Cables per Phase (6 cables per circuit)	1 tube per phase (3 "developing" new large GIL tubes per circuit)	£3.64m/km (£1.82m/km)	£28.32m/km (£14.16m/km)	£31.13m/km (£15.56m/km)

IET, PB/CCI Report short-form label	Circuit Ratings by Voltage		Technology Configuration			Capital Costs		
	275kV AC Technologies	400kV AC Technologies	Overhead Line (OHL)	AC Underground Cable (AC Cable)	Gas Insulated Line (GIL)	Overhead Line (OHL)	AC Underground Cable (AC Cable)	Gas Insulated Line (GIL)
	Total rating for two Circuits (2 x rating of each circuit)	Total rating for two Circuits (2 x rating of each circuit)	No. of Conductors Sets "bundles" on each arm/circuit of a pylon	No. of Cables per phase	No of direct buried GIL tubes per phase	Cost for a "double" two circuit pylon route (Cost per circuit, of a double circuit pylon route)	Cost for a two circuit AC cable route (Cost per circuit, of a two circuit AC cable route)	Cost for a two circuit GIL route (Cost per circuit, of a two circuit GIL route)
Hi	N/A	6930MVA (2 x 3465MVA)	3 conductor sets per circuit (9 conductors per circuit)	3 Cables per Phase (9 cables per circuit)	2 tubes per phase (6 standard GIL tubes per circuit)	£3.98m/km (£1.99m/km)	£39.89m/km (£19.95m/km)	£43.25m/km (£21.63m/km)

Notes:

- Capital Costs for all technologies are based upon rural/arable land installation with no major obstacles (examples of major obstacles would be Roads, Rivers, Railways etc…)
- All underground AC Cable and GIL technology costs are for direct buried installations only. AC cable and GIL Tunnel installations would have a higher capital installation cost than direct buried rural installations. However, AC cable or GIL replacement costs following the end of conductor life would benefit from re-use of the tunnel infrastructure.
- AC cable installation costs exclude the cost of reactors and mid point switching stations, which are described later in this appendix.
- 4. 275kV circuits will often require Super-Grid Transformers (SGT) to allow connection into the 400kV system, SGT capital costs are not included above but described later in this appendix.
- 5. 275kV AC cable installations above 1000MVA, as indicated in the table above, would require 2 cables per phase to be installed to achieve ratings of 1595MVA per circuit at 275kV.

D.4.3 Table D.2 provides a summary of the capital costs associated with the key[12] components of transmission circuits for each technology option. Additional equipment is required for technology configurations that include new:

- AC underground cable circuits
- Connections between 400 kV and 275 kV parts of the National Grid's transmission system.

D.4.4 The following sections provide an overview of the additional requirements associated with each of these technology options and indicative capital costs of additional equipment.

D.5 AC Underground Cable additional equipment

D.5.1 Appendix C of this Report provides a summary of the electrical characteristics of AC underground cable systems and explains that reactive gain occurs on AC underground cables.

D.5.2 Table D.3 provides a summary of the typical reactive gain within AC underground cable circuits forming part of the National Grid's transmission system.

Table D.3 – Reactive Gain Within AC underground cable circuits

Category	Voltage	Design	Reactive Gain per circuit
Lo	275 kV	One 2500 mm^2 cable per phase	5 Mvar/km
Med	275 kV	Two 2500 mm^2 cable per phase	10 Mvar/km
Lo	400 kV	One 2500 mm^2 cable per phase	10 Mvar/km
Med	400 kV	Two 2500 mm^2 cable per phase	20 Mvar/km
Hi	400 kV	Three 2500 mm^2 cable per phase	30 Mvar/km

D.5.3 National Grid is required to ensure that reactive gain on any circuit that forms part of its transmission system does not exceed 225 Mvar. Above this limit, reactive gain would lead to unacceptable voltages (voltage requirements as defined in the NETS SQSS). In order to manage reactive gain and therefore voltages, reactors are installed on AC underground cable circuits to ensure that reactive gain in total is less than 225 Mvar.

D.5.4 For example, a 50 km "Med" double circuit would have an overall reactive gain of 1000 Mvar per circuit (2000 Mvar in total for two circuits). The standard shunt reactor size installed at 400 kV on the National Grid transmission system is 200 Mvar. Therefore four 200 Mvar reactors (800 Mvar) need to be installed on each circuit or eight 200 Mvar reactors (1600 Mvar) reactors for the two circuits. Each of these reactors cost £8.7m adding £69.6m to an overall cable cost for the example double circuit above.

[12] Components that are not required for all technology options are presented separately in this Appendix.

1.2.1 Mid point switching stations may be required as part of a design to meet the reactive compensation requirements for AC underground cable circuit. The need for switching stations is dependent upon cable design, location and requirements which cannot be fully defined without detailed design.

D.5.5 For the purposes of economic appraisal of Strategic Options, National Grid includes a cost allowance that reflects typical requirements for switching stations. These allowances shown in Table D.4 are:

Table D.4 – Reactive Gain Within AC underground cable circuits

Category	Switching Station Requirement
Lo	Reactive Switching Station every 60km between substations
Med	Reactive Switching Station every 30km between substations
Hi	Reactive Switching Station every 20km between substations

D.5.6 It is noted that more detailed design of AC underground cable systems may require a switching station after a shorter or longer distance than the typical values used by National Grid at the initial appraisal stage.

D.5.7 Table D.5 below shows the capital cost associated with AC underground cable additional equipment.

Table D.5 – Additional costs associated with AC underground cables

Category	Cost per mid point switching station	Cost per 200 Mvar reactor
Lo	£15.09m	£8.7m per reactor
Med	£18.44m	
Hi	£18.44m	

D.6 Connections between AC 275 kV and 400 kV circuits additional equipment

D.6.1 Equipment that transform voltages between 275kV and 400kV (a 400/275 kV supergrid transformer or “SGT”) is required for any new 275 kV circuit that connects to a 400 kV part of the National Grid’s transmission system (and vice versa). The number of supergrid transformers needed is dependent on the capacity of the new circuit. National Grid can estimate the number of SGTs required as part of an indicative scope of works that is used for the initial appraisal of Strategic Options.

D.6.2 Table D.6 below shows the capital cost associated with the SGT requirements.

Table D.6 – Additional costs associated with 275kV circuits requiring connection to the 400kV system

275kV Equipment	Capital Cost (SGT - including civil engineering work)
400/275kV SGT 1100MVA (excluding switchgear)	£7.75m per SGT

D.7 High Voltage Direct Current ("HVDC") Capital Cost Estimates

D.7.1 Conventional HVDC technology sizes are not easily translated into the "Lo", "Med" and "Hi" ratings suggested in the IET, PB/CCI report. Whilst National Grid information for HVDC is presented for each of these categories, there are differences in the circuit capacity levels. As part of an initial appraisal, National Grid's assessment is based on a standard 2GW converter size. Higher ratings are achievable using multiple circuits.

D.7.2 The capital costs of HVDC installations can be much higher than for equivalent AC overhead line transmission routes. Each individual HVDC link, between each converter station, requires its own dedicated set of HVDC cables. HVDC may be more economic than equivalent AC overhead lines where the route length is many hundreds of kilometres.

D.7.3 Table D.7 provides a summary of technology configuration and capital cost information (in financial year 2020/21 prices) for each of the HVDC technology options that National Grid considers as part of an appraisal of Strategic Options.

Table D.7 – HVDC Technology Capital Costs for 2GW installations

HVDC Converter Type	2 GW Total HVDC Link Converter Costs (Converter Cost at Each End)	2GW DC Cable Pair Cost
Current Source Technology or "Classic" HVDC	£475m HVDC link cost (£237.5m at each end)	£3.09m/km VDC
Voltage Source Technology HVDC	£534.38m HVDC link cost (£267.19m at each end)	£3.09m/km

Notes:

- Sometimes a different HVDC capacity (different from the required AC capacity) can be utilised for a project due to the different way HVDC technology can control power flow. The capacity requirements for HVDC circuits will be specified in any option considering HVDC. The cost shall be based upon Table C.4 above.
- Where a single HVDC Link is proposed as an option, to maintain compliance with the NETS SQSS, there may be a requirement to install an additional "Earth Return" DC cable. For example a 2GW Link must be capable of operating at ½ its capacity i.e. 1GW during maintenance or following a cable fault. To allow this operation the additional cable known as an "Earth Return" must be installed, this increases cable costs by a further 50% to £4.6m/km.

- Capital Costs for HVDC cable installations are based upon subsea or rural/arable land installation with no major obstacles (examples of major obstacles would be Subsea Pipelines, Roads, Rivers, Railways etc…)

D.7.4 Costs can be adjusted from this table to achieve equivalent circuit ratings where required. For example a "Lo" rating 3190 MW would require two HVDC links of (1.6 GW capacity each), while "Med" and "Hi" rating 6380 MW-6930 MW would require three links with technology stretch of (2.1-2.3 GW each).

D.7.5 Converter costs at each end can also be adjusted, by Linear scaling, from the cost information in Table D.7, to reflect the size of the HVDC link being appraised. HVDC Cable costs are normally left unaltered, as operating at the higher load does not have a large impact the cable costs per km.

D.7.6 The capacity of HVDC circuits assessed for this Report is not always exactly equivalent to capacity of AC circuits assessed. However, Table D.8 below illustrates how comparisons may be drawn using scaling methodology outlined above.

Table D.8 – Illustrative example using scaled 2GW HVDC costs to match equivalent AC ratings (only required where HVDC requirements match AC technology circuit capacity requirements)

IET, PB/CCI Report short-form label	Converter Requirements (Circuit Rating)	Total Cable Costs/km (Cable Cost per link)	CSC "Classic" HVDC Total Converter Capital Cost (Total Converter cost per end)	VSC HVDC Total Converter Capital Cost (Total Converter cost per end)
Lo	2 x 1.6 GW HVDC Links (3190MW)	£5.82m/km (2 x £2.91/km)	£704m (4 x £176m [4 converters 2 each end])	(4 x £736m (4 x £184m [4 converters 2 each end])
Med	3 x 2.1* GW HVDC Links (6380MW)	£9.27m/km (3 x £3.09/km)	£1422m (6 x £237m [6 converters 3 each end])	£1602m (6 x £267m [6 converters 3 each end])
Hi	3 x 2.3* GW HVDC Links (6930MW)	£10.32m/km (3 x £3.44/km)	£1818m (6 x £303m [6 converters 3 each end])	£1890m (6 x £315m [6 converter 3 each end])

Notes:

- Costs based on 2GW costs shown in Table C.4 and table shows how HVDC costs are estimated based upon HVDC capacity required for each option.
- Scaling can be used to estimate costs for any size of HVDC link required.
- *Current subsea cable technology for VSC design restricted to 2GW, so above examples illustrative if technology should become available.

D.8 Indication of Technology end of design life replacement impact

D.8.1 It is unusual for a part of National Grid's transmission system to be decommissioned and the site reinstated. In general, assets will be replaced towards the end of the assets

design life. Typically, transmission assets will be decommissioned and removed only as part of an upgrade or replacement by different assets.

D.8.2 National Grid does not take account of replacement costs in the Circuit Lifetime Cost assessment.

D.8.3 National Grid's asset replacement decisions take account of actual asset condition. This may lead to actual life of any technology being longer or shorter than the design life, depending on the environment it is installed in, lifetime loading, equipment family failures among other factors for example.

D.8.4 The following provides a high level summary of common replacement requirements applicable to specific technology options:

- OHL - Based on the design life of component parts, National Grid assumes an initial design life of around 40 years for overhead line circuits. After the initial 40 year life of an overhead line circuit, substantial pylon replacement works would not normally be required. The cost of Pylons is reflected in the initial indicative capital costs, but the cost of replacement at 40 years would not include the pylon cost. As pylons have an 80 year life and can be re-used to carry new replacement conductors. The replacement costs for overhead line circuits at the end of their initial design life are assessed by National Grid as being around 50% of the initial capital cost, through the re-use of pylons.
- AC underground Cable - At the end of their initial design life, circa 40 years, replacement costs for underground cables are estimated to be equal or potentially slightly greater than the initial capital cost. This is because of works being required to excavate and remove old cables prior to installing new cables in their place in some instances.
- GIL - At the end of the initial design life, circa 40 years, estimated replacement costs for underground GIL would be equal to or potentially greater than the initial capital cost. This is because of works being required to excavate and remove GIL prior to installing new GIL in their place in some instances.
- HVDC - It should be noted at the end of the initial design life, circa 40 years, replacement costs for HVDC are significant. This due to the large capital costs for the replacement of converter stations and the cost of replacing underground or subsea DC cables when required.

D.9 Net Present Value Cost Estimates

D.9.1 At the initial appraisal stage, National Grid prepares estimates of the costs that are expected to be incurred during the design lifetime of the new assets. National Grid considers costs associated with:

- Operation and maintenance
- Electrical losses

D.9.2 For both categories, Net Present Value ("NPV") calculations are carried out using annual cost estimates and a generic percentage discount rate over the design life period associated with the technology option being considered.

D.9.3 The design life for all technology equipment is outlined in the technology description in Appendix C. The majority of expected design lives are of the order of 40 years, which is used to assess the following NPV cost estimates below.

D.9.4 In general discount rates used in NPV calculations would be expected to reflect the normal rate of return for the investor. National Grid's current rate of return is 6.25%.

However, the Treasury Green Book recommends a rate of 3.5% for the reasons set out below[13]

"The discount rate is used to convert all costs and benefits to 'present values', so that they can be compared. The recommended discount rate is 3.5%. Calculating the present value of the differences between the streams of costs and benefits provides the net present value (NPV) of an option. The NPV is the primary criterion for deciding whether government action can be justified."

D.9.5 National Grid considered the impact of using the lower Rate of Return (used by UK Government) on Circuit Lifetime Cost of losses assessments for transmission system investment proposals. Using the rate of 3.5% will discount loss costs, at a lower rate than that of 6.25%. This has the overall effect of increasing the 40 year cost of losses giving a more onerous cost of losses for higher loss technologies.

D.9.6 For the appraisal of Strategic Options, National Grid recognises the value of closer alignment of its NPV calculations with the approach set out by government for critical infrastructure projects.

D.10 Annual Operations and Maintenance Cost

D.10.1 The maintenance costs associated with each technology vary significantly depending upon type. Some electrical equipment is maintained regularly to ensure system performance is maintained. More complex equipment like HVDC converters have a significantly higher cost associated with them, due to their high maintenance requirements for replacement parts. Table D.9 shows the cost of maintenance for each technology, which unlike capital and losses is not dependent on capacity.

[13] http://www.hm-treasury.gov.uk/d/green_book_complete.pdf Paragraph 5.49 on Page 26 recommends a discount rate of 3.5% calculation for NPV is also shown in the foot note of this page.

NPV calculations are carried out using the following equation over the period of consideration.

Dn =1/(1 + r)n

Where Dn = Annual Loss Cost, r = 3.5% and n = 40 years

Table D.9 – Annual maintenance costs by Technology

	Overhead Line (OHL)	AC Underground Cable (AC Cable)	Gas Insulated Line (GIL)	High Voltage Direct Current (HVDC)
Circuit Annual maintenance cost per two circuit km (AC) (Annual cost per circuit Km [AC])	£2,660/km (£1,330/km)	£5,644.45/km (£2,822.22/km)	£2,687.83/km (£1,343.92/km)	£134/km Subsea Cables
Associated equipment Annual Maintenance cost per item	N/A	£6,719.58 per reactor £41,661 per switching station	N/A	£1,300,911 per converter station
Additional costs for 275 kV circuits requiring connection to the 400kV system				
275/400 kV SGT 1100 MVA Annual maintenance cost per SGT	£6,719.58 per SGT	£6,719.58 per SGT	£6.719.58 per SGT	N/A

D.11 Annual Electrical Losses and Cost

D.11.1 At a system level annual losses on the National Grid electricity system equate to less the 2% of energy transported. This means that over 98% of the energy entering the transmission system from generators/interconnectors reaches the bulk demand substations where the energy transitions to the distribution system. Electricity transmission voltages are used to reduce losses, as more power can be transported with lower currents at transmission level, giving rise to the very efficient loss level achieved of less than 2%. The calculations below are used to show how this translates to a transmission route.

D.11.2 Transmission losses occur in all electrical equipment and are related to the operation and design of the equipment. The main losses within a transmission system come from heating losses associated with the resistance of the electrical circuits, often referred to as I2R losses (the electrical current flowing through the circuit, squared, multiplied by the resistance). As the load (the amount of power each circuit is carrying) increases, the current in the circuit is larger.

D.11.3 The average load of a transmission circuit which is incorporated into the transmission system is estimated to be 34% (known as a circuit average utilisation). This figure is calculated from the analysis of the load on each circuit forming part of National Grid's transmission system over the course of a year. This takes account of varying generation and demand conditions and is an appropriate assumption for the majority of Strategic Options.

D.11.4 This level of circuit utilisation is required because if a fault occurs there needs to be an alternative route to carry power to prevent wide scale loss of electricity for homes, business, towns and cities. Such events would represent a very small part of a circuit's 40 year life, but this availability of alternative routes is an essential requirement at all times to provide secure electricity supplies to the nation.

D.11.5 In all AC technologies the power losses are calculated directly from the electrical resistance and impedance properties of each technology and associated equipment. Table D.10 provides a summary of circuit resistance data for each AC technology and capacity options considered in this Report.

Table D.10 – AC circuit technologies and associated resistance per circuit

IET, PB/CCI Report short-form label	AC Overhead Line Conductor Type (complete single circuit resistance for conductor set)	AC Underground Cable Type (complete single circuit resistance for conductor set)	AC Gas Insulated Line (GIL) Type (complete single circuit resistance for conductor set)
Lo	2 x 570 mm^2 (0.025 Ω/km)	1 x 2500 mm^2 (0.013 Ω/km*)	Single Tube per phase (0.0086 Ω/km)
Med	2 x 850 mm^2 (0.0184 Ω/km)	2 x 2500 mm^2 (0.0065 Ω/km*)	Single Tube per phase (0.0086 Ω/km)
Hi	3 x 700 mm^2 (0.014 Ω/km)	3 x 2500 mm^2 (0.0043 Ω/km*)	Two tubes per phase (0.0065 Ω/km)
Losses per 200Mvar Reactor required for AC underground cables			
Reactor Losses	N/A	0.4MW per reactor	N/A
Additional losses for 275kV circuits requiring connection to the 400 kV system			
275 kV options only 275/400 kV SGT losses	0.2576 Ω (plus 83 kW of iron losses) per SGT	0.2576 Ω (plus 83 kW of iron losses) per SGT	0.2576 Ω (plus 83 kW of iron losses) per SGT

D.11.6 The process of converting AC power to DC is not 100% efficient. Power losses occur in all elements of the converter station: the valves, transformers, reactive compensation/filtering and auxiliary plant. Manufacturers typically represent these losses in the form of an overall percentage. Table D.11 below shows the typical percentage losses encountered in the conversion process, ignoring losses in the DC cable circuits themselves.

Table D.11 – HVDC circuit technologies and associated resistance per circuit

HVDC Converter Type	2 GW Converter Station losses	2GW DC Cable Pair Losses	2GW Total Link loss
Current Source (CSC) Technology or "Classic" HVDC	0.5% per converter	Ignored	1% per HVDC Link
Voltage Source (VSC) Technology HVDC	1.0% per converter	Ignored	2% per HVDC Link

D.11.7 The example calculation explained in detail below is for "Med" category circuits and has been selected to demonstrate the principles of the mathematics set out in this section. This example does not describe specific options set out within this report. A detailed example explanation of the calculations used to calculate AC losses is included in Appendix E.

D.11.8 The circuit category, for options contained within this report, is set out within each option. The example below demonstrates the mathematics and principles, which is equally applicable to “Lo”, “Med” and “Hi” category circuits, over any distance.

D.11.9 The example calculations (using calculation methodology described in Appendix E) of instantaneous losses for each technology option for an example circuit of 40 km “Med” capacity 6380 MVA (two x 3190 MVA).

- Overhead Lines = (2 x 3) x 1565.5 A2 x (40 x 0.0184 Ω/km) = 10.8 MW
- Underground Cable = (2 x 3) x1565.5 A^2 x (40 x 0.0065 Ω/km) + (6 x 0.4MW) = 6.2 MW
- Gas Insulated Lines = (2 x 3) x 1565.5 A2 x (40 x 0.0086 Ω/km) = 5.1 MW
- CSC HVDC = 34% x 6380 MW x 1% = 21.7 MW
- VSC HVDC = 34% x 6380 MW x 2% = 43.4 MW

D.11.10 An annual loss figure can be calculated from the instantaneous loss. National Grid multiplies the instantaneous loss figure by the number of hours in a year and also by the cost of energy. National Grid uses £60/MWhr.

D.11.11 The following is a summary of National Grid’s example calculations of Annual Losses and Maintenance costs for each technology option for an example circuit of 40 km “Med” capacity 6380 MVA (two x 3190 MVA).

- Overhead Line annual loss = 10.8 MW x 24 x 365 x £60/MWhr = £5.7m.
- U-ground Cable annual loss = 6.2 MW x 24 x 365 x £60/MWhr = £3.3m.
- Gas Insulated lines annual loss = 5.1 MW x 24 x 365 x £60/MWhr = £2.7m
- CSC HVDC annual loss = 21.7 MW x 24 x 365 x £60/MWhr = £11.4m
- VSC HVDC annual loss = 43.4 MW x 24 x 365 x £60/MWhr = £22.8m

D.12 Example Circuit Lifetime Costs and NPV Cost Estimate

D.12.1 The annual Operation, Maintenance and loss information is assessed against the NPV model at 3.5% over 40 years and added to the capital costs to provide a Circuit Lifetime Cost for each technology.

D.12.2 Table D.12 shows an example for a “Med” capacity route 6380 MVA (2 x 3190 MVA) 400 kV, 40km in length over 40 years.

Table D.12 – Example Circuit Lifetime Cost table (rounded to the nearest £m)

Example 400 kV "Med" Capacity over 40km	Overhead Line (OHL)	AC Underground Cable (AC Cable)	Gas Insulated Line (GIL)	CSC High Voltage Direct Current (HVDC)	VSC High Voltage Direct Current (HVDC)
Capital Cost	£145.6m	£1167.6m	£1,244.8m	£1,795.8m	£1,973.9m
NPV Loss Cost over 40 years at 3.5% discount rate	£125m	£62.6m	£58.4m	£235.6m	£471.2m
NPV Maintenance Cost over 40 years at 3.5% discount rate	£2.33m	£5.5m	£2.4m	£171.7m	£171.7m
Circuit Lifetime Cost	£273m	£1,236m	£1,306m	£2,203m	£2,617m

Appendix E
Mathematical Principles used for AC Loss Calculation

E.1.1 This Appendix provides a detailed description of the mathematical formulae and principles that National Grid applies when calculating transmission system losses. The calculations use recognised mathematical equations which can be found in power system analysis textbooks.

E.1.2 The example calculation explained in detail below is for “Med” category circuits and has been selected to demonstrate the principles of the mathematics set out in this section. This example does not describe specific options set out within this report.

E.1.3 The circuit category, for options contained within this report, is set out within each option. The example below demonstrates the mathematics and principles, which is equally applicable to “Lo”, “Med” and “Hi” category circuits, over any distance.

E.2 Example Loss Calculation (1) – 40 km 400 kV “Med” Category Circuits

E.2.1 The following is an example loss calculation for a 40 km 400 kV “Med” category (capacity of 6,380 MVA made up of two 3,190 MVA circuits).

E.2.2 Firstly, the current flowing in each of the two circuits is calculated from the three phase power equation of $P= \sqrt{3}V_{LL}I_{LL} \cos \theta$. Assuming a unity power factor ($\cos \theta= 1$), the current in each circuit can be calculated using a rearranged form of the three phase power equation of:

(In a star (Y) configuration electrical system $I = I_{LL} = I_{LN}$)

$I = P/\sqrt{3}V_{LL}$

Where, P is the circuit utilisation power, which is 34% of circuit rating as set out in D.40 of Appendix D, which for the each of the two circuits in the “Med” category example is calculated as:

P = 34% x 3190 MVA = 1,084.6 MVA

and, V_{LL} is the line to line voltage which for this example is 400 kV.

For this example, the average current flowing in each of the two circuits is:

$I = 1,084.6 \times 106/(\sqrt{3} \times 400 \times 103) = 1,565.5$ Amps

E.2.3 The current calculated above will flow in each of the phases of the three phase circuit. Therefore from this value it is possible to calculate the instantaneous loss which occurs at the 34% utilisation loading factor against circuit rating for any AC technology.

E.2.4 For this “Med” category example, the total resistance for each technology option is calculated (from information in Appendix D, Table D10) as follows:

Overhead Line = 0.0184Ω/km x 40 km = 0.736 Ω

Cable Circuit[14] = 0.0065Ω/km x 40 km = 0.26 Ω

Gas Insulated Line = 0.0086Ω/km x 40 km = 0.344 Ω

These circuit resistance values are the total resistance seen in each phase of that particular technology taking account the number of conductors needed for each technology option.

E.2.5 The following is a total instantaneous loss calculation for the underground cable technology option for the "Med" category example:

Losses per phase are calculated using $P=I^2R$

1,565.52 x 0.26 = 0.64 MW

Losses per circuit are calculated using $P=3I^2R$

3 x 1,565.52 x 0.26 = 1.91 MW

Losses for "Med" category are calculated by multiplying losses per circuit by number of circuits in the category.

2 x 1.91 MW = 3.8 MW

E.2.6 For underground cable circuits, three reactors per circuit are required (six in total for the two circuits in the "Med" category). Each of these reactors has a loss of 0.4 MW. The total instantaneous losses for this "Med" category example with the underground cable technology option are assessed as:

3.8 + (6 x 0.4) = 6.2 MW

E.2.7 The same methodology is applied for the other AC technology option types for the "Med" category example considered in this Appendix. The following is a summary of the instantaneous total losses that were assessed for each technology option:

Overhead Lines = (2 x 3) x 1,565.52 x 0.736 = 10.8 MW

Cables = (2 x 3) x 1,565.52 x 0.26 + (6 x 0.4) = 6.2 MW

Gas Insulated Lines = (2 x 3) x 1,565.52 x 0.344 = 5.1 MW

E.3 Example Loss Calculation (2) – 40 km 275 kV "Lo" Category Circuits Connecting to a 400 kV part of the National Grid's transmission system

E.3.1 The following is an example loss calculation for a 40 km 275 kV "Lo" category (capacity of 3,190 MVA made up of two 1,595 MVA circuits) and includes details of how losses of the supergrid transformer ("SGT") connections to 400 kV circuits are assessed. This example assesses the losses associated with the GIL technology option up to a connection point to the 400 kV system.

E.3.2 The circuit utilisation power (P) which for the each of the two circuits in the "Lo" category example is calculated as:

P = 34% x 1,595 = 542.3 MVA

[14] A 40 km three phase underground cable circuit will also require three reactors to ensure that reactive gain is managed within required limits.

For this example, the average current flowing in each of the two circuits is:

$I = 542.3x10^6/(\sqrt{3} \times 275x10^3) = 1{,}138.5$ Amps

E.3.3 For this "Lo" category example, the total resistance for the GIL technology option is calculated (from information in Appendix D, Table D10) as follows:

0.0086Ω/km x 40 km = 0.344 Ω

E.3.4 The following is a total instantaneous loss calculation for the GIL technology option for this "Lo" category example:

Losses per circuit are calculated using $P=3I^2R$

3 x 1138.5 x 0.344 = 1.35 MW

Losses for "Lo" category 275 kV circuits are calculated by multiplying losses per circuit by number of circuits in the category

2 x 1.35 MW = 2.7 MW

E.3.5 SGT losses also need to be included as part of the assessment for this "Lo" category example which includes connection to 400 kV circuits. SGT resistance[15] is calculated (from information in Appendix D, Table D10) as 0.2576 Ω.

E.3.6 The following is a total instantaneous loss calculation for the SGT connection part of this "Lo" category example:

The average current flowing in each of the two SGT 400 kV winding are calculated as:

$I_{HV} = 542.3 \times 10^6/(\sqrt{3} \times 400x10^3) = 782.7$ Amps

Losses per SGT are calculated using $P=3I^2R$

SGT Loss = 3 x 782.7 x 0.2576 = 0.475 MW

Iron Losses in each SGT = 84kW

Total SGT instantaneous loss (one SGT per GIL circuit) = (2 x 0.475) + (2 x 0.084) = 1.1 MW.

E.3.7 For this example, the total "Lo" category loss is the sum of the calculated GIL and SGT total loss figures:

"Lo" category loss = 2.7 + 1.1 = 3.8 MW

[15] Resistance value referred to the 400 kV side of the transformer.

Appendix F
Glossary of Terms and Acronyms

AC		Alternating Current
AC Cable		AC Underground Cable
Conductor		used to transport power
CSC		Current Source Converter
DC		Direct Current
DCO		Development Consent Order issued under the Planning Act 2008
Electricity Act		The Electricity Act 1989
EN-1		Overarching National Policy Statement for Energy
EN-3		National Policy Statement for Renewable Energy Infrastructure
EN-5		National Policy Statement for Electricity Network Infrastructure
EN-6		National Policy Statement for Nuclear Power Generation
GIL		Gas Insulated Lines
HVDC		High Voltage Direct Current
IET, PB/CCI Report		An independent report endorsed by the Institution of Engineering and Technology by Parsons Brinckerhoff in association with Cable Consulting International (2012)
Insulators		used to safely connect conductors to pylons
IPC		Infrastructure Planning Commission
National Grid		National Grid Electricity Transmission plc
NPV		Net Present Value
NETS SQSS		National Electricity Transmission System Security and Quality of Supply Standard
NGESO		Operator of National Electricity Transmission System
NPS		National Policy Statements
NSIP		Nationally Significant Infrastructure Project
Ofgem		The Office of Gas and Electricity Markets
OHL		Overhead Line
(the) Policy		National Grid's Stakeholder, Community and Amenity Policy
Pylons		used to support conductors

RIBA		Royal Institute of British Architects
SF_6		Sulphur Hexafluoride (gas used to provide electrical insulation)
Span length		distance between adjacent pylons
STC		System Operator – Transmission Owner Code
SGT		Super-Grid Transformer
The Authority		Gas and Electricity Markets Authority, the governing body of Ofgem
T-pylon		monopole pylon design developed by National Grid
Transmission Licence		Licence granted under Section 6(1)(b) of the Electricity Act
volt (V)		The electrical unit of potential difference 1 kilovolt (kV) = 1,000volts
watt (W)		The SI unit of power 1 kilowatt (kW) = 1,000watts 1 megawatt (MW) = 1,000kW 1 gigawatt (GW) = 1,000MW
XLPE		Cross Linked Polyethylene (solid material used to provide electrical insulation)

Appendix G
Appraisal study areas

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