

VikingLink

nationalgrid

Route Corridor Selection Report Non-Technical Summary

Document Reference: VKL-08-06-G500-006

September 2016



Co-financed by the European Union
Connecting Europe Facility

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1 Introduction

1.1 Background

- 1.1.1 Viking Link is a proposed 1,400 megawatt (MW) high voltage direct current (DC) electricity interconnector between Bicker Fen in Great Britain (GB) and Revsing in Denmark. The link will allow electricity to be exchanged between the two countries.
- 1.1.2 The project is being jointly developed by National Grid Viking Link Limited (NGVL) and its development partner Energinet.dk.
- 1.1.3 Viking Link will enable Great Britain to trade energy as a commodity within the European Energy Market. This will help improve Britain's security of electricity supply and provide access to cheaper, low carbon energy.
- 1.1.4 The interconnector will be approximately 760 kilometres in total length between GB and Denmark. The submarine cables will cross through United Kingdom (UK), Dutch, German and Danish exclusive economic zones. This is shown in Figure 1.1 below.



Figure 1.1 Map of exclusive economic zones to be crossed

- 1.1.5 Viking Link will connect into the British high voltage electricity transmission network at the existing National Grid Electricity Transmission Limited (NGET) substation at Bicker Fen. More

- information on how Bicker Fen Substation was selected is set out in the *Viking Link Strategic Options Report (April 2016)*¹ which is available on the project website.
- 1.1.6 Viking Link is also needed from a European Union (EU) energy policy perspective and will significantly contribute to market integration, sustainability, security of supply and promote competition.
- 1.1.7 Further information on interconnectors can be found in *Getting More Connected*², a paper prepared by National Grid setting out the opportunities presented by interconnector development as well as in *Smart Power*³ a report prepared by the National Infrastructure Commission to help ensure that the country's electricity system is fit for the future.
- 1.1.8 In June 2016, the UK held a referendum and voted to leave the EU. The outcome of the referendum does not influence the plans to build and operate Viking Link. National Grid and its partner, Energinet.dk, believe there remains a strong business case for Viking Link.
- 1.1.9 The project, which will be jointly funded by National Grid and Energinet.dk, has been granted regulatory approval by Ofgem, which closely scrutinises costs and benefits in the interests of GB consumers.

1.2 About Viking Link

- 1.2.1 Viking Link will involve the construction of a converter station in GB and in Denmark, the installation of DC submarine and underground cables between each converter station, and high voltage alternating current (AC) underground cables between the converter station and substation in each country. The different parts of the Viking Link interconnector are shown overleaf in Figure 1.2.

Viking Link Strategic Options Report available from <http://viking-link.com/documents>

²Getting More Connected available from <http://www2.nationalgrid.com/About-us/European-business-development/Interconnectors/>

³ Smart Power available from:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/505218/IC_Energy_Report_web.pdf

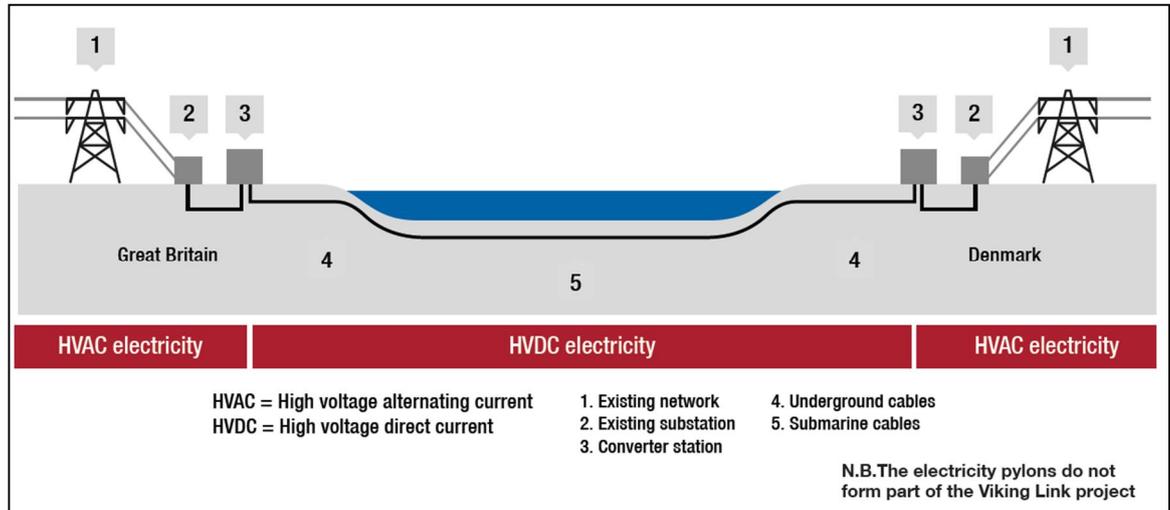


Figure 1.2 Overview of Viking Link

1.2.2 The onshore work in GB will include bringing a pair of electricity cables onshore and running them underground to a new converter station before connecting into the existing NGET Substation at Bicker Fen. This is known as the 'UK Onshore Scheme' and will include the following main parts:

- subject to survey, a landfall located at Sandilands in East Lindsey, Lincolnshire (known as LF1A). This is where the two offshore (submarine) high voltage DC cables transition to onshore high voltage DC cables at an underground Transition Joint Pit (TJP);
- an underground high voltage DC cable route (comprising two DC cables and an optional fibre optic cable) from the landfall to a converter station;
- subject to survey a converter station located on North Ing Drove in South Holland, Lincolnshire (known as CS1) connecting to the existing Bicker Fen 400 kV Substation;
- an underground AC cable route from the converter station to Bicker Fen 400 kV Substation; and
- specialist equipment facilitating the connection within the existing Bicker Fen 400 kV Substation.

1.2.3 More information on how the preferred sites for the landfall and the converter station were selected can be found in the *UK Onshore Scheme: Preferred Sites Selection Report*⁴.

⁴UK Onshore Scheme: Preferred Sites Selection Report available from <http://viking-link.com/documents>

1.3 Planning permission

- 1.3.1 All the components of the UK Onshore Scheme will require planning permission under the Town and Country Planning Act 1990 and applications will be submitted to the local planning authorities as appropriate.

1.4 Purpose of report

- 1.4.1 This report aims to provide a non-technical summary of the *UK Onshore Scheme: Route Corridor Selection Report*⁵ which outlines the steps taken to identify and assess a shortlist of potential route corridor options to take forward for public consultation in September and October 2016.

⁵UK Onshore Scheme: Route Corridor Selection Report available from <http://viking-link.com/documents>

2 Approach to routeing

2.1 The UK onshore scheme

2.1.1 A staged approach has been followed in the development of the UK Onshore Scheme. Figure 2.1 below sets out this staged approach. The first step was to identify and assess potential sites for the landfall and converter station.

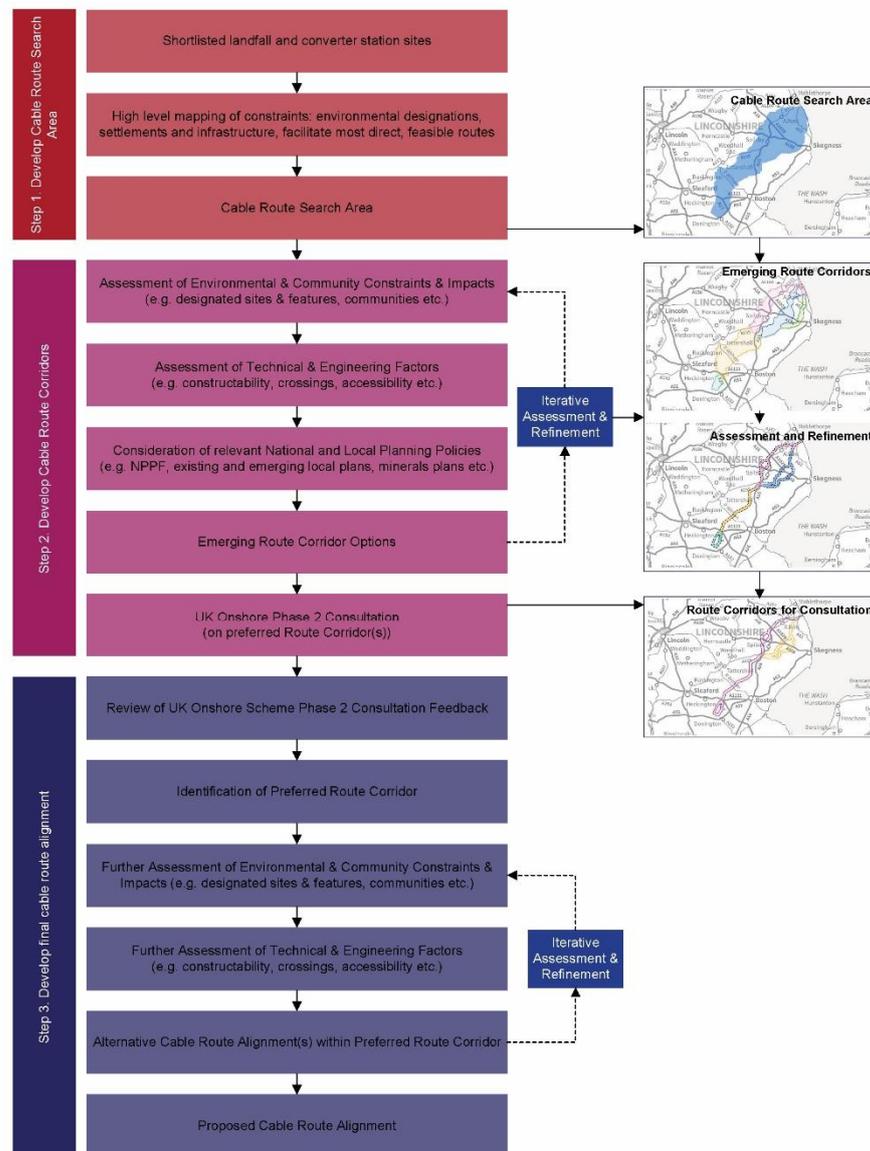


Figure 2.1 Approach to cable routeing

2.2 Landfall sites

2.2.1 The landfall siting assessment identified six potential landfall sites. An assessment of the potential impacts on the environment and local community, alongside preliminary technical and engineering factors, including land take required and accessibility, was then undertaken. The assessment resulted in three of the landfall sites being discounted for technical and/or environmental reasons. The three remaining potential landfall sites (LF1a, LF1 and LF2) were considered to be feasible options and were shortlisted and taken forward to the Phase 1 Consultation.

2.3 Converter station sites

2.3.1 The converter station siting assessment included the identification and assessment of 21 potential converter station sites. The assessment of the sites considered potential impacts on the environment and the local community alongside preliminary technical and engineering factors, including land take required and accessibility. The assessment resulted in 17 of the converter station sites being discounted for technical and/or environmental reasons. The four remaining potential converter station sites (CS1, CS3, CS5 and CS9) were considered to be feasible options and were shortlisted to be taken forward to the Phase 1 Consultation.

2.3.2 Phase 1 Consultation was held over a six-week period in April and May 2016. At the close of the consultation period a total of 588 pieces of correspondence were received. Further information on the consultation process and all feedback received from the Phase 1 Consultation is contained in the *UK Onshore Scheme: Phase 1 Consultation Feedback Report*⁶.

2.3.3 Further detail on how the feedback received fed into the selection of the preferred landfall and converter station sites can be found in section 2.6 of this report.

2.4 Identification of the cable route search area

2.4.1 Having identified the options for the landfall and the converter station sites, the next stage was to refine the initial study area to ensure that a cable route search area was identified which would facilitate the development of different route corridors between any of the shortlisted landfall and converter station site options. The development of the cable route search area considered the following:

- the locations of the shortlisted landfall and converter station options;
- major environmental designations within the study area;
- areas of settlement and the primary road network; and
- physical environmental constraints within the study area such as topography, major watercourses and areas of flood risk.

⁶UK Onshore Scheme: Phase 1 Consultation Feedback Report available from <http://viking-link.com/documents>

2.4.2 The cable route search area, which resulted from the review of the UK Onshore Scheme study area, is illustrated in Figure 2.2. It occupies an area of almost 600 km² and extends for approximately 60 km from the Lincolnshire coast in the east to Bicker Fen in the west. The cable route search area allows for the development of route corridor options between any of the three shortlisted landfall options (LF1, LF1a and LF2) and the four shortlisted converter station options (CS1, CS3, CS5 and CS9) which were taken forward to the UK Onshore Scheme Phase 1 Consultation in April and May 2016.

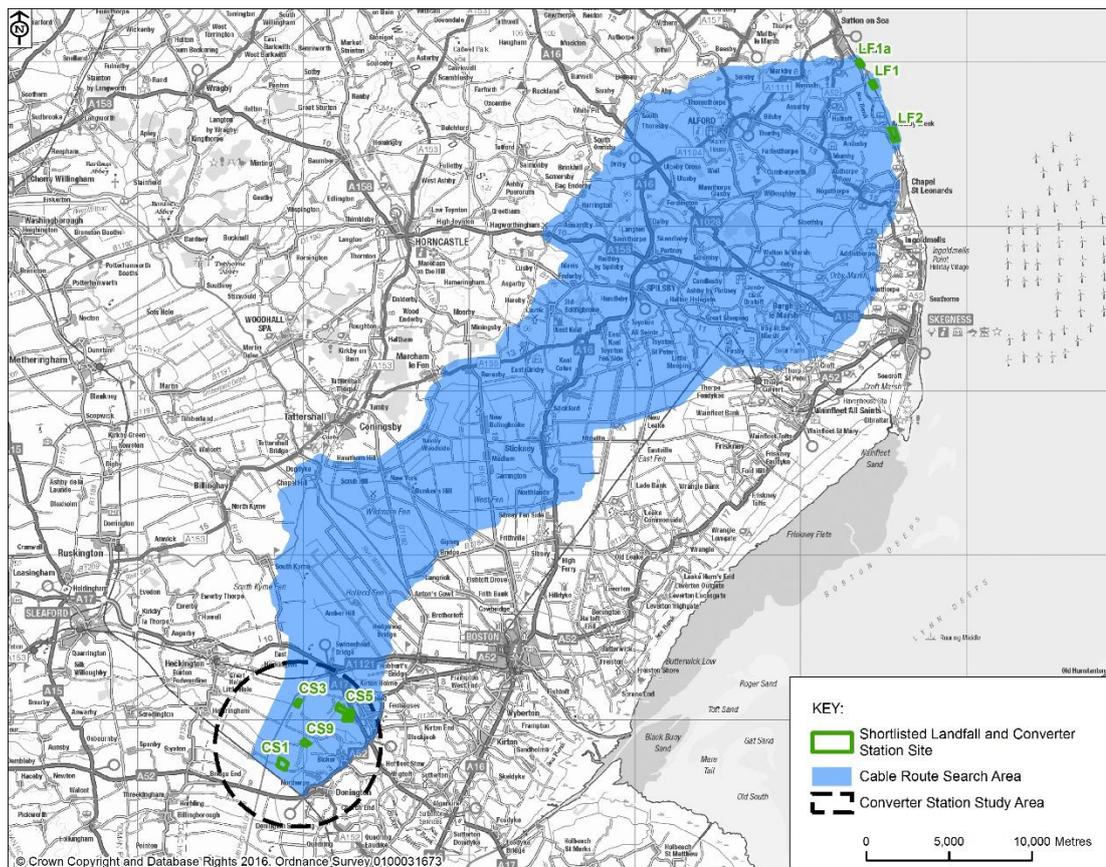


Figure 2.2 Cable route search area

2.5 Identification of route corridor options

2.5.1 The next stage in the identification of route corridor options involved a review of the cable route search area, taking into account technical and engineering considerations alongside environmental and planning considerations.

2.5.2 The technical and engineering considerations included:

- constructability;
- working area requirements; and
- accessibility.

2.5.3 The environmental and planning considerations included:

- settlements, community and tourism;
- geology and hydrogeology;
- hydrology;
- agriculture and soils;
- landscape;
- ecology;
- archaeology and heritage;
- relevant planning policy; and
- existing and proposed developments.

As a result of this work, five initial route corridor options were identified, as illustrated below in Figure 2.3.

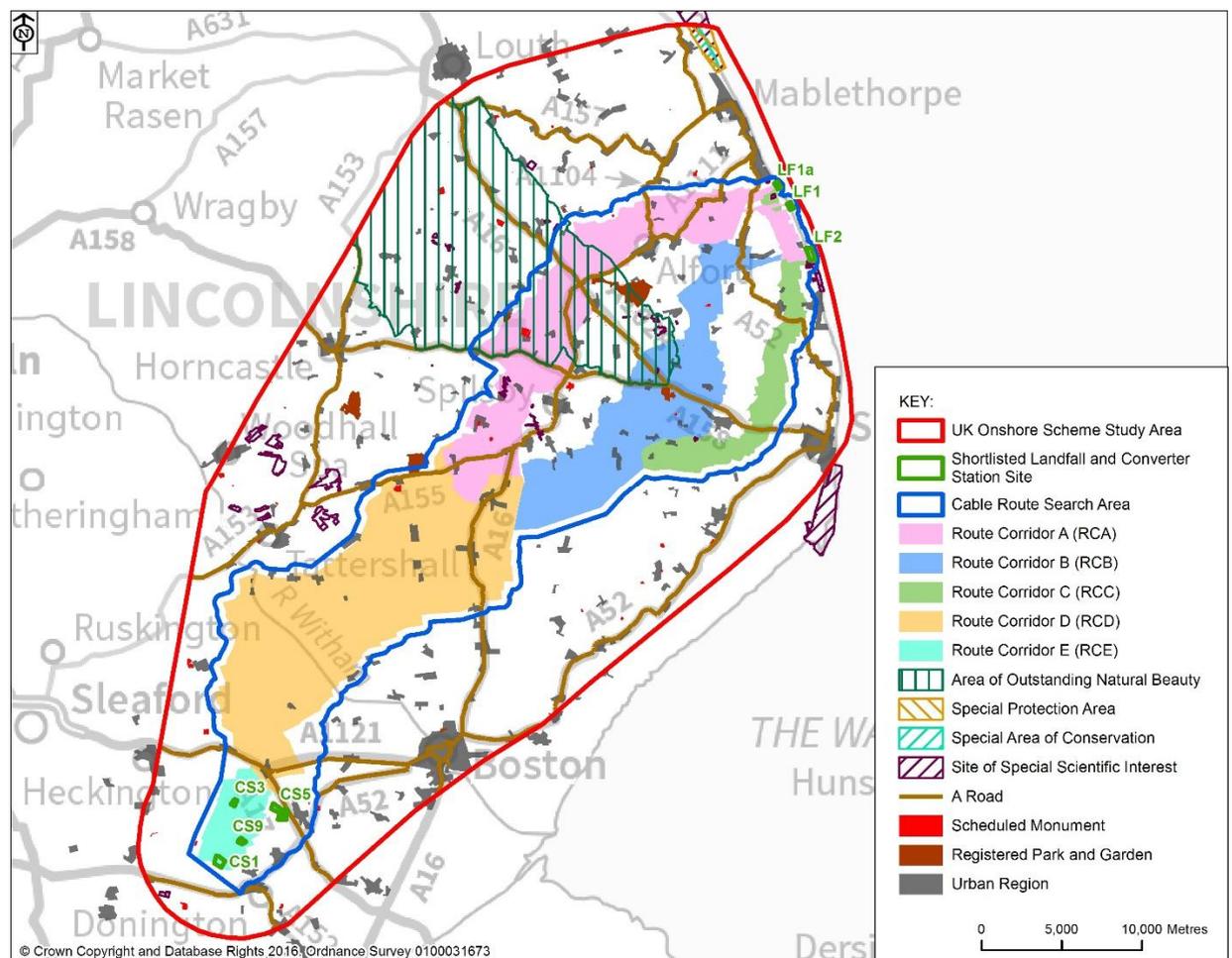


Figure 2.3 Initial route corridor options

- 2.5.4 Three route corridors were identified (A, B and C) which provide route corridor options from the possible landfall sites and onwards around the different constraints present in the east of the cable study area. These include the Lincolnshire Wolds Area of Outstanding Natural Beauty (AONB), the National Trust Gunby Estate, and the Lincolnshire Coastal Grazing Marshes Project (LCGMP) Target Area at Burgh-le-Marsh.
- 2.5.5 To the west, two route corridors (D and E) connect from corridors A, B and C in the vicinity of Stickford on the A16 and from here provide opportunities to connect to the four shortlisted converter station site options.
- 2.5.6 Engagement with key parties, including local planning authorities, statutory bodies and stakeholder organisations, has also helped inform the development of the route corridor options.

Route corridor A

- 2.5.7 Route corridor A (RCA) is approximately 29 km in length and is the most northerly of the route corridor options under consideration. Whilst it is partly routed through the Lincolnshire Wolds AONB, it benefits from good access via the existing road network and provides the opportunity to avoid lower lying coastal areas which typically require a larger number of watercourse crossings.
- 2.5.8 RCA runs west from the coast crossing the A52 north of Huttoft, and the A1111 and A1104 to the north of Bilsby and Alford respectively. It then runs parallel with the A1104 and A16, crossing the A16 north of the Ulceby Cross roundabout. RCA runs through part of the Lincolnshire Wolds AONB where the land reaches a height of 95 m above ordnance datum (AOD) at Langton Hill. As it descends it crosses the A158 west of Partney, the B1195 west of Spilsby and the A158 between East Kirkby and West Keal and terminates north of Hagnaby Lock.

Route corridor B

- 2.5.9 Route corridor B (RCB) is approximately 28 km in length and provides opportunities for a shorter crossing of the Lincolnshire Wolds AONB as well as opportunities to avoid it completely. The latter would, however, require routes either within or in closer proximity to the National Trust estate land surrounding Gunby Hall or the Burgh-le-Marsh Coastal Grazing Marshes Target Area which form part of the LCGMP.
- 2.5.10 RCB follows the same route as RCA away from the coast in a westerly direction crossing the A52 before it turns south crossing the B1449 between Thurlby and Mumby. It continues south west across the low lying coastal plain to run between Willoughby and Sloothby and then runs south crossing the A158 between Gunby and Burgh-le-Marsh. RCB then turns south west towards Bratoff and Great Steeping where it crosses the B1195 and turns south to cross the Steeping River to the east of Little Steeping. To the west of the Steeping River, it crosses flat very low lying fenland including large drains such as Hobhole Drain between Little Steeping and Stickford where it joins route corridor D.

Route corridor C

- 2.5.11 Route corridor C (RCC) is approximately 32 km in length and runs south, parallel to the coast and between Hogsthorpe and Chapel St Leonards where it crosses the A52 (from LF1a at Sandilands the initial part of the cable route would run south within RCA to join RCC). The corridor continues south-southwest, across the low lying coastal plain, moving inland from the coast to avoid the settlements of Ingoldmells and Skegness and crosses the A158 to the east of Burgh le Marsh. It then turns west and runs south of Burgh le Marsh to Irby in the Marsh where it crosses the B1195 and joins RCB.

Route corridor D

- 2.5.12 Route corridor D (RCD) is approximately 24 km in length and is a wider corridor (5 – 8 km wide) into which all previous route corridor options connect. It covers an area from the A16 (between Keal Cotes and Northlands) running south west to the A17 (between East Heckington and Swineshead Bridge); bordered to the north by the A155 and Catchwater Drain and to the west by Kyme Eau and the B1395 (between South Kyme and East Heckington). The southern boundary of the corridor is marked by Northlands, Gipsey Bridge and Langrick. Within the corridor, potential cable routes would need to cross Medlam Drain, the B1183, Newham Drain, West Fen Drain, the B1192, River Witham, North Forty Foot Drain, the A1121 and/or the A17 as well as the Nottingham to Skegness railway and South Forty Foot Drain before entering corridor E.

Route corridor E

- 2.5.13 Route corridor E (RCE) is approximately 5 km in length and is roughly delineated by the Boston–Nottingham railway to the north and the Lincoln to Peterborough railway to the south west and follows either side of South Forty Foot Drain from Swineshead Bridge to North Ing. The villages of Northorpe and Bicker are located close to the A52 to the south east outside of the corridor.
- 2.5.14 These five route corridor options were then individually assessed against the same key technical, engineering, environmental and planning considerations. The details of this assessment can be found in section 4 of the *UK Onshore Scheme: Route Corridor Selection Report*⁷.

2.6 Preferred landfall and converter station sites

- 2.6.1 Whilst assessment of the route corridor options was being undertaken, NGVL carried out Phase 1 Consultation with the local community and other stakeholders on the three shortlisted landfall options (LF1, LF1a and LF2) and the four shortlisted converter station options (CS1, CS3, CS5 and CS9). On Monday 22 August 2016, NGVL announced its preferred landfall and converter station sites.

⁷UK Onshore Scheme: Route Corridor Selection Report available from <http://viking-link.com/documents>

Preferred landfall site

- 2.6.2 Taking into account the findings of the technical and environmental assessments of the shortlisted sites as well as the feedback received in response to the Phase 1 Consultation, NGVL identified LF1a as the preferred landfall site.
- 2.6.3 More information on how the preferred site for the converter station was selected can be found in the *UK Onshore Scheme: Preferred Sites Selection Report*⁸.
- 2.6.4 LF1a is shown in Figure 2.4 below. This site provides the opportunity to reduce the potential impact on nearby communities and coastal environmental constraints such as the LCGMP.

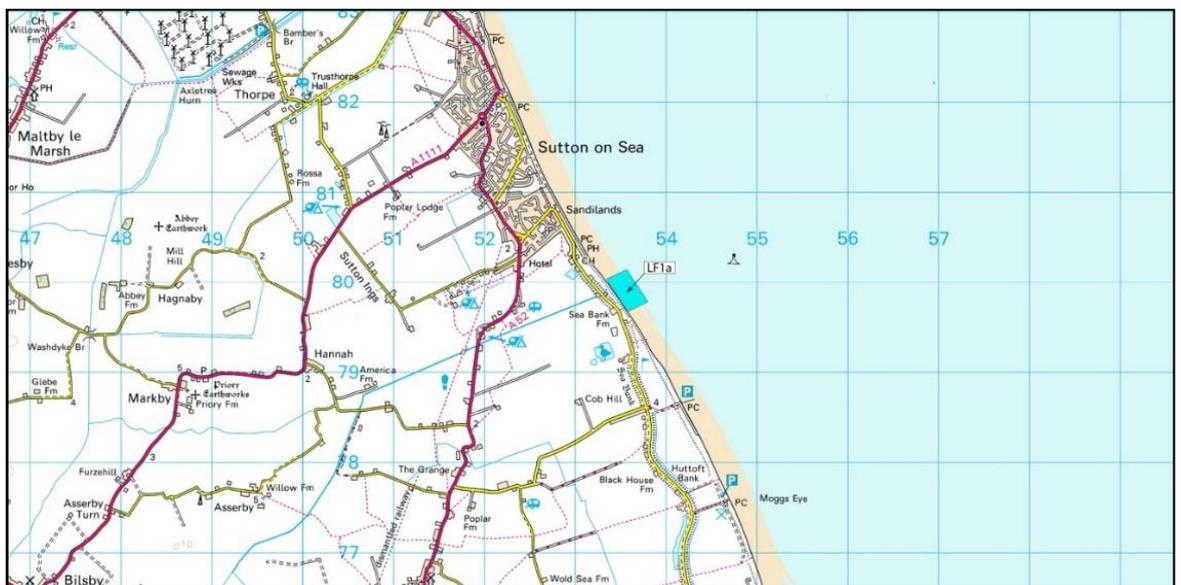


Figure 2.4 Preferred landfall site

Preferred converter station site

- 2.6.5 NGVL identified CS1 as the preferred converter station site after considering feedback provided during the Phase 1 consultation, along with environmental and technical information. CS1 is shown in Figure 2.5 overleaf. Whilst CS1 would require an overall longer DC cable route, it provides opportunities to mitigate the potential impacts of the converter station on the environment and local community through its planning and design.
- 2.6.6 More information on how the preferred site for the converter station was selected can be found in the *UK Onshore Scheme: Preferred Sites Selection Report*⁸.

⁸UK Onshore Scheme: Preferred Sites Selection Report available from <http://viking-link.com/documents>



Figure 2.5 Preferred converter station site

2.7 Refined route corridor options

2.7.1 Following a detailed assessment of each route corridor option against technical and engineering, environmental and planning considerations, they were further refined to develop a narrower route corridor (approximately 1 km wide for its length) whilst taking into account the preferred landfall site as well as the preferred converter station site.

3 Assessment of refined route corridors

3.1 Refined route corridor A

3.1.1 The key constraints which have informed the refinement of RCA include (from east to west):

- Routing away from the landfall, the route corridor has been narrowed, occupying open fields adjacent to the Anderby and Huttoft Lincolnshire Coastal Grazing Marsh Project (LCGMP).
- Moving inland, RCA has been narrowed to approximately 0.5 km wide for short sections in order to provide some separation from the settlements of Markby and Asserby (located to the north and south respectively) and Saleby and Thoresthorpe (also located to the north and south respectively) and reduce the potential for disturbance during installation works.
- The refined RCA follows a relatively direct route through the Lincolnshire Wolds AONB for approximately 8 km, subject to detailed routeing. It largely avoids (or provides the opportunity to avoid) landscape features which contribute to the landscape designation, including woodland, hedgerows and ridges or high points. Some features such as hedgerows cannot be completely avoided and would be an important consideration in landscape reinstatement and enhancement.
- RCA splits at Langton, providing two alternative routes avoiding steep slopes in this area which also show evidence of landslip. The split also ensures the settlements of Langton, Aswardby and Sausthorpe are avoided. The number and distribution of heritage assets in this area mean that complete avoidance of non-designated assets is not possible, however, the refined route corridor ensures that direct impacts on designated assets can be avoided.
- The eastern and western splits re-join to the north of Raithby where a small number of ecological and heritage constraints are present. Ecological constraints comprise the Mavis Enderby Valley Site of Special Scientific Interest (SSSI) and Manor Farm Local Wildlife Site (LWS) to the west of the refined corridor. Heritage constraints comprise a ridge and furrow system (from the Historic Environment Record (HER)) and Raithby conservation area to the east of the refined route corridor.
- From Raithby to East and West Keal, a small number of constraints are present within the refined corridor, including priority habitat and non-designated heritage sites (from the HER). It may be the case that not all of these constraints are avoidable and site specific mitigation may be required, such as habitat reinstatement or controlled strip and record where heritage assets may be present.

Conclusion

3.1.2 The refined RCA provides opportunities to develop technically feasible cable routes which largely avoid environmental constraints and settlements. Key benefits of RCA include opportunities for

access from existing roads (reducing the amount of temporary access which may be required) as well as the requirement for fewer crossings (in particular watercourse crossings). In some instances, environmental constraints such as the AONB or heritage interests may not be avoided by routeing, however, specific mitigation could be developed to reduce potential impacts such as landscape reinstatement and enhancement, and pre-construction archaeological investigation.

3.1.3 The refined RCA is illustrated in Figure 3.1 below.

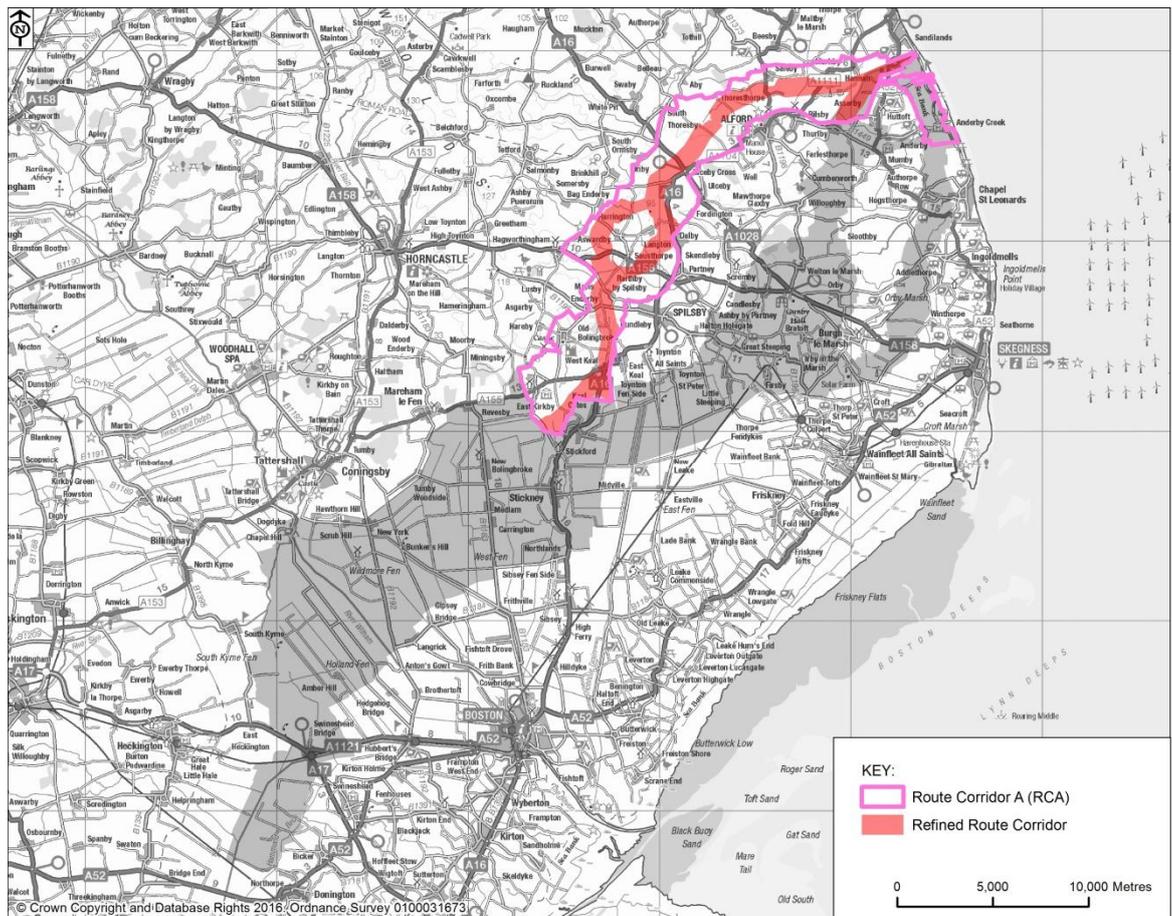


Figure 3.1 Refined route corridor A

3.2 Refined route corridor B

3.2.1 The key constraints which have informed the refinement of RCB include (from east to west):

- Routeing away from the landfall the route corridor has been narrowed occupying open fields adjacent to the Anderby and Huttoft LCGMP.
- RCB has been refined so that it largely avoids settlements, however, moving inland there are a number of small settlements located on the margins of the corridor including Thurlby, Mumby, Bonthorpe, Willoughby and Sloothby. These are typically connected by roads which cross the route corridor.

- Within this section of RCB a small number of non-designated heritage assets are present. The distribution of these assets means that some are located partly or wholly within the corridor. Where these constraints cannot be avoided by detailed routeing, additional site specific mitigation may be required.
- North of Hasthorpe, RCB splits in two in order to avoid the Gunby Estate and its surrounding land. This provides an option to the west, partly routed through the AONB, and an option to the east, routed closer to settlements and partly through the Burgh le Marsh LCGMP Target Area and National Trust land.
 - The eastern alignment avoids the 'core' area comprising Gunby Hall and surrounding land but is in closer proximity to Orby, Firsby and Little Steeping. The route corridor has been narrowed as far as possible due to the number and distribution of constraints in the area. A number of constraints are located within or adjacent to RCB including small pockets of National Trust land, non-designated heritage assets from the HER and the northern most parts of the Burgh le Marsh LCGMP Target Area.
 - The western alignment also avoids the 'core' area comprising Gunby Hall and surrounding land but is routed for approximately 3 km through the Lincolnshire Wolds AONB. Comparatively it encounters fewer constraints and is shorter than the eastern alignment. Constraints which are present include non-designated heritage assets and non-statutory ecological designations.

3.2.2 The eastern and western splits re-join to the west of Little Steeping. Within this section of the refined route corridor there are no major constraints which influence the extent of the corridor. Sites of Nature Conservation Interest are located to the north of the corridor but can be avoided during detailed routeing.

Conclusion

3.2.3 The refined RCB provides opportunities to develop technically feasible cable routes as well as avoiding the majority of environmental constraints and settlements. The benefits of RCB will depend on the detailed route selected. For example, avoiding Gunby Hall and the AONB requires a longer route in closer proximity to settlements with more watercourse crossings and would result in direct impacts on the Burgh le Marsh LCGMP Target Area. A shorter route could be developed avoiding Gunby Hall but this would require approximately 3 km of the route corridor going through the AONB. For both options specific mitigation would be required to reduce potential impacts, such as landscape or habitat reinstatement and enhancement.

3.2.4 The refined RCB is illustrated in Figure 3.2 overleaf.

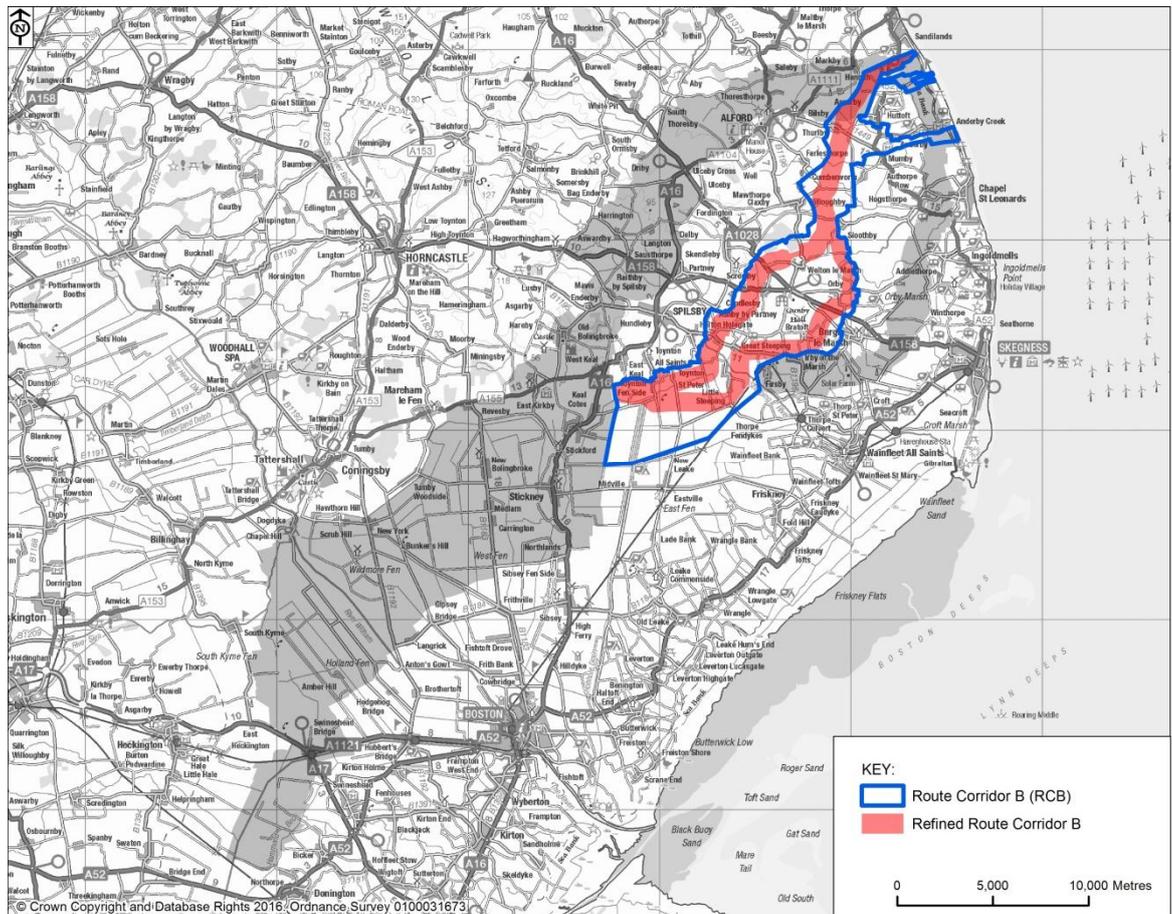


Figure 3.2 Refined route corridor B

3.3 Refined route corridor C

3.3.1 As there are a number of significant constraints present within and which could be affected by RCC, this option was discounted and has not been subject to any further refinement.

3.4 Refined route corridor D

3.4.1 The key constraints which have informed the refinement of RCD include (from east to west):

- RCD has been refined so that it avoids the extensive area of peat to the east of the A16 and runs south to the west of the A16.
- The route corridor therefore avoids linear settlements along the A16 including Keal Cotes, Stickford, Stickney and Northlands; as well as New Bolingbroke and Medlam on the B1183.
- The route corridor largely avoids the Sand and Gravel Mineral Safeguarding Areas (MSA) around Coningsby and Wildmore Fen with only the southern boundary of the MSA encroaching into RCD.

- The refined RCD would allow a crossing of the River Witham close to Langrick Bridge and cable routing through the south of the original route corridor where the existing road network would better accommodate construction traffic.

Conclusion

3.4.2 The refined RCD provides opportunities to develop technically feasible cable routes. There are fewer environmental constraints or settlements present within RCD compared with other route corridors and those which are present are avoidable. Land is predominantly agricultural with fewer designated sites present. The key constraints which have influenced the routing of RCD include the location and extent of MSAs, major water course crossings and the layout of the road network which influences accessibility.

3.4.3 The refined RCD is illustrated in Figure 3.3 below.

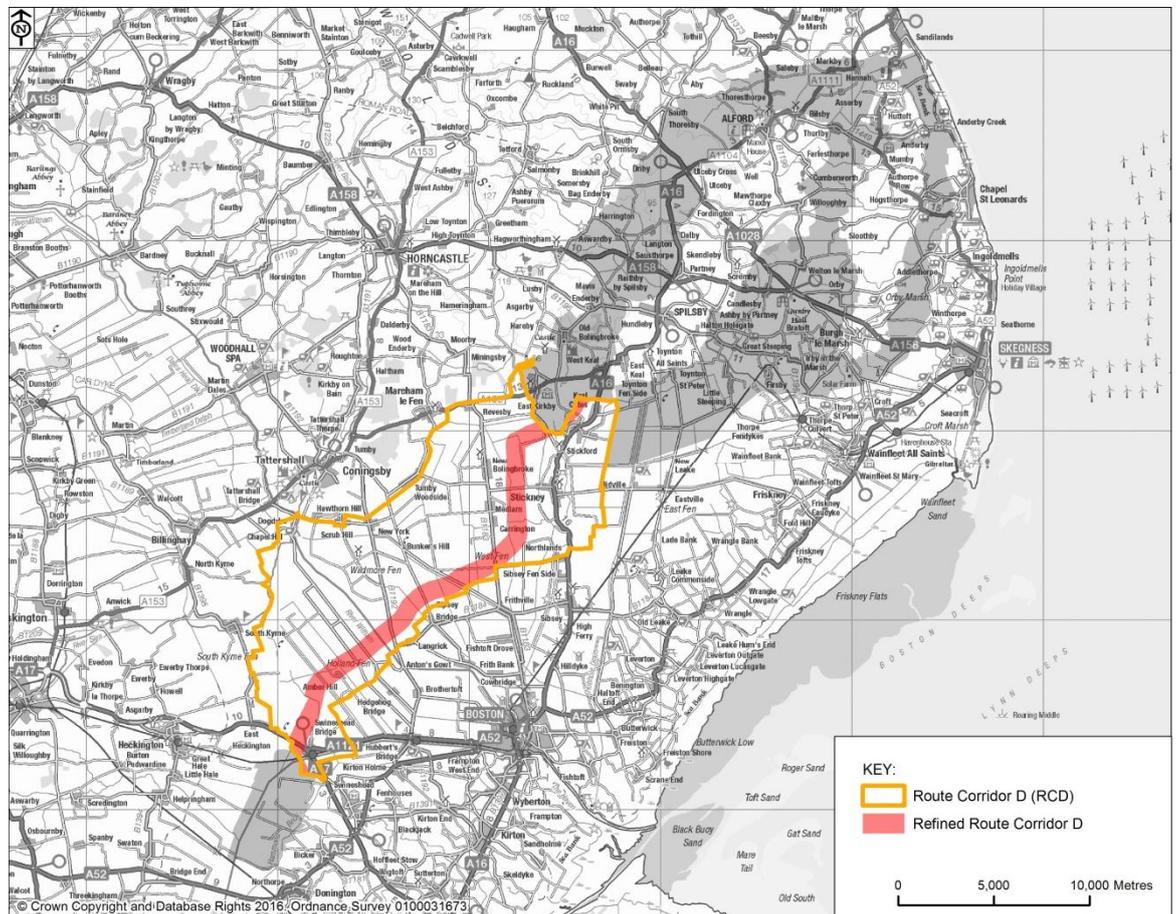


Figure 3.3 Refined route corridor D

3.5 Refined route corridor E

3.5.1 The key constraints which have informed the refinement of RCE include (from east to west):

- Existing infrastructure in the centre of RCE including Bicker Fen Wind Farm and Bicker Fen Substations (Western Power Distribution (WPD) and NGET respectively) and associated overhead power lines. RCE splits providing two alternative route corridor options that avoid the existing infrastructure; a corridor to the east and a corridor to the west of South Forty Foot Drain.
- The two corridors avoid, as far as possible, the proposed alignment of the Triton Knoll onshore cable route that runs adjacent to the east bank of South Forty Foot Drain.
 - The eastern corridor would require a crossing of the Triton Knoll onshore cable route to the north of RCE;
 - The western corridor would avoid the need to cross the Triton Knoll onshore cable route.
- The Boston to Nottingham railway and South Footy Foot Drain would need to be crossed by a cable route and would present a constraint to construction access.
 - The eastern corridor would allow the Boston to Nottingham railway and the South Footy Foot Drain to be crossed together in one crossing with construction access via the A17 and construction of a haul road/or potential use of the proposed Triton Knoll access road; whereas;
 - The western corridor would require crossing the Boston to Nottingham railway separately to the South Forty Foot Drain with construction access via an existing minor road which also requires construction of a level crossing across the railway. This would require road improvements and the construction of a haul road for construction access to the west side of South Forty Foot Drain but there is no existing access across the drain from the southern part of this corridor.
- An area of non-designated heritage assets which lie in the area surrounding the substations at Bicker Fen, in the centre of RCE would be avoided by both corridor options.
- The western split of RCE follows a relatively direct route to the west of South Forty Foot Drain, and where possible avoids isolated properties.

Conclusion

3.5.2 The refined RCE provides opportunities to develop technically feasible cable routes whilst largely avoiding existing infrastructure and environmental constraints. In some instances, constraints may not be avoided by routeing, however, specific mitigation could be developed to reduce potential impacts such as those on non-designated heritage interests.

3.5.3 The refined RCE is illustrated in Figure 3.4 overleaf.



Figure 3.4 Refined route corridor E

4 Route Corridor Options for Phase 2 Consultation

4.1 Overview

- 4.1.1 In following the route corridor identification and assessment process outlined in previous chapters, route corridor options RCA, RCB, RCD and RCE have all been identified as providing feasible opportunities to develop a cable route. RCC has been discounted as it is considered to be less preferable when the technical and environmental constraints are taken in to account.
- 4.1.2 Different combinations of the refined RCA or RCB and RCD and RCE can provide a continuous route corridor which will connect the preferred landfall site (LF1a) at Sandilands, East Lindsey to the preferred converter station site (CS1) at North Ing Drove, South Holland.
- 4.1.3 Two continuous route corridors have been identified and these are referred to as the 'Purple Route Corridor' (comprising parts of RCA, RCD and RCE) and the 'Orange Route Corridor' (comprising parts of RCB, RCD and RCE). These are shown in Figure 4.1 and Figure 4.2 below.
- 4.1.4 It is these continuous route corridors from the preferred landfall to the preferred converter station which are the subject of Phase 2 Consultation.

4.2 The Purple Route Corridor

- 4.2.1 The Purple Route Corridor is up to 63.9 km long. It routes through East Lindsey, Boston Borough, South Holland and, subject to detailed routeing, North Kesteven.
- 4.2.2 The Purple Route Corridor is shown in Figure 4.1 overleaf.
- 4.2.3 The Purple Route Corridor is considered to be technically feasible, however, crossings and access pose a constraint which require further consideration. It includes a total of 221 crossings, of which 168 are watercourse crossings.
- 4.2.4 The eastern part of the route corridor has good access options with a number of A and B roads offering relatively direct construction access from the existing road network. The west of the route corridor is comparatively more constrained with less frequent A and B roads. In addition, there are a number of constraints which present obstacles to construction access such as Steeping River, River Witham, Boston to Nottingham railway and South Forty Foot Drain.
- 4.2.5 The Purple Route Corridor avoids settlements and scattered individual properties for the majority of its length but a number of settlements are located on its margins such as Asserby, Raithby, and East and West Keal. There is one pinch point where the corridor narrows between Saleby and Thoresthorpe. By avoiding settlements as much as possible disturbance during construction can be reduced.

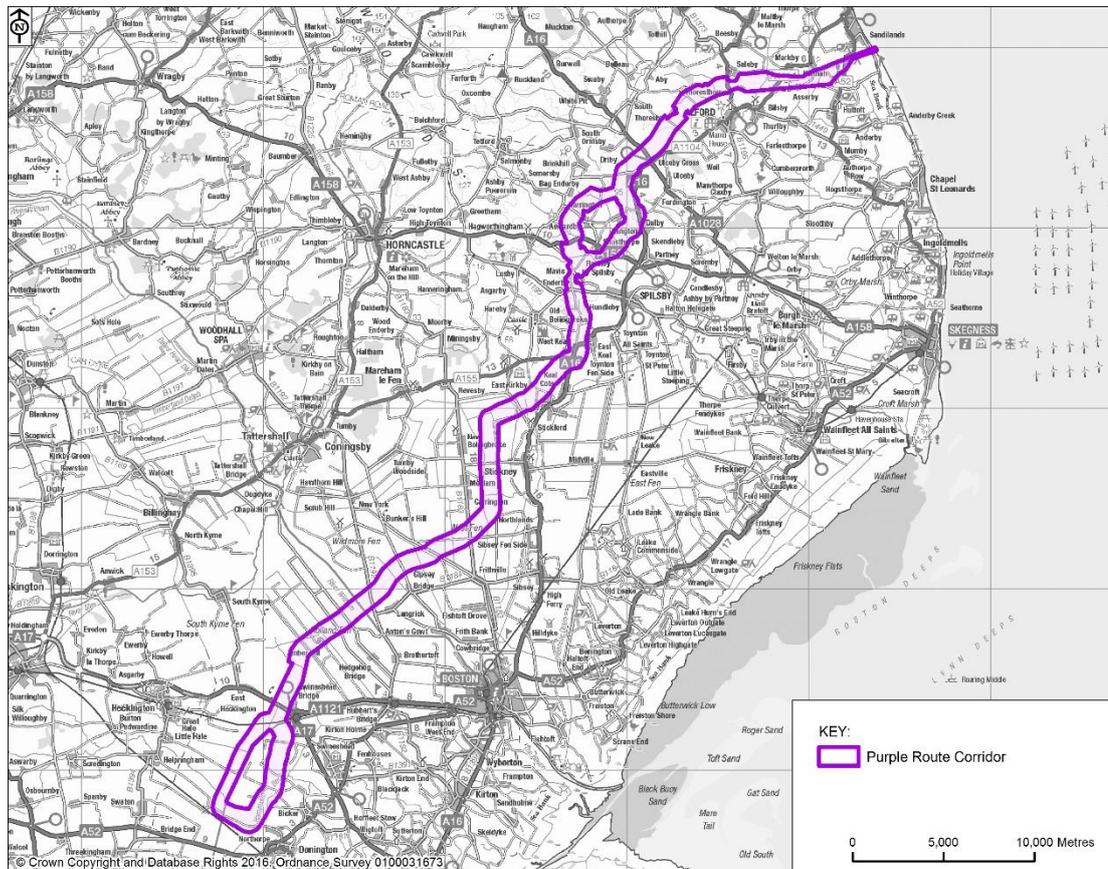


Figure 4.1 The Purple Route Corridor

4.2.6 The Purple Route Corridor avoids the majority of designated environmental sites or interests with the exception of the AONB. In developing a detailed route within the AONB, consideration will need to be given to the landscape features which contribute to the site’s designation such as woodland and hedgerows. The majority of features are considered to be avoidable such that in the long term a cable route developed within the Purple Route Corridor is not expected to result in any long term impacts on landscape character.

4.2.7 The Purple Route Corridor generally avoids environmental constraints including non-designated sites. The exception to this is non-designated heritage assets which, due to their number and distribution, cannot be avoided. Subject to detailed routeing taking into account the relationship of these sites with other designated heritage interests, as well as other factors, site specific mitigation would be required including pre-construction archaeological investigations.

4.3 The Orange Route Corridor

4.3.1 The Orange Route Corridor is up to 67.4 km long. It routes through East Lindsey, Boston Borough, South Holland and, subject to detailed routeing, North Kesteven.

4.3.2 The Orange Route Corridor is shown in Figure 4.2 below.

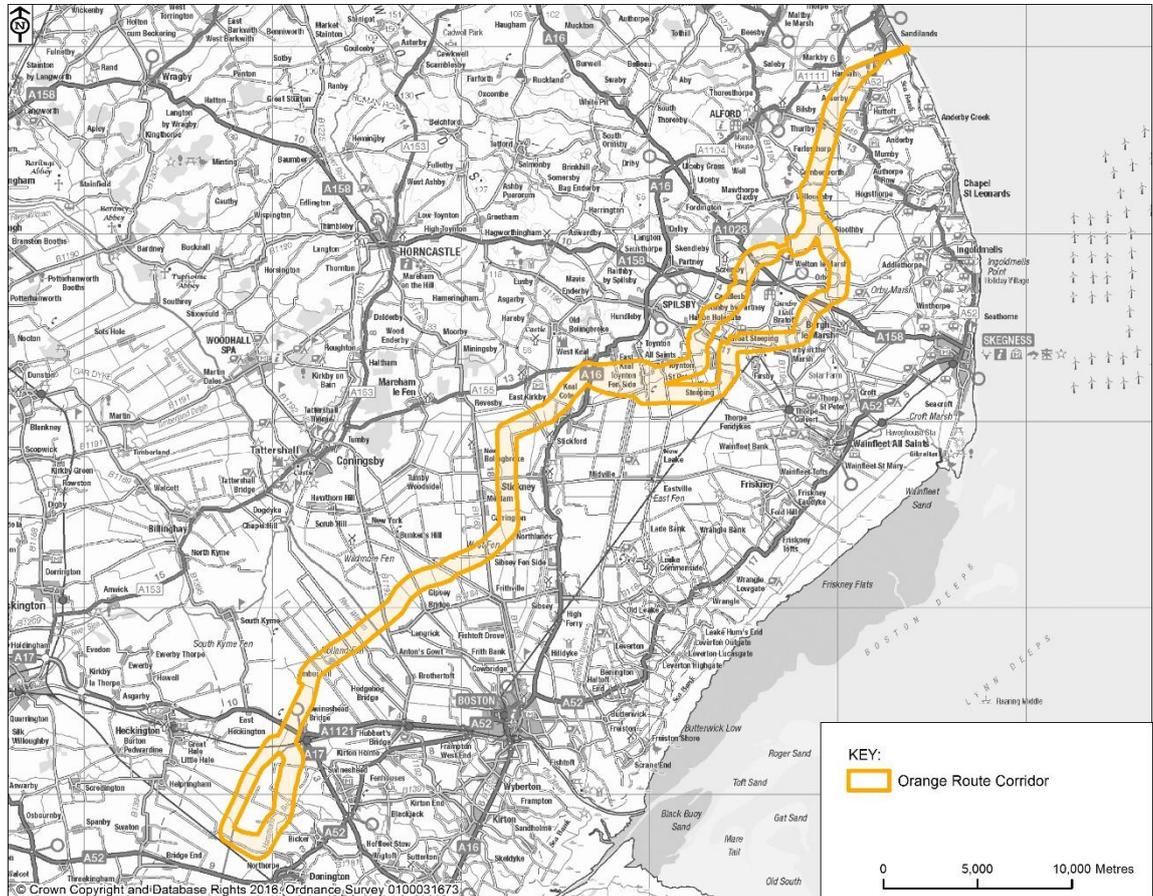


Figure 4.2 The Orange Route Corridor

4.3.3 The Orange Route Corridor is considered to be technically feasible, however, crossings and access pose a constraint which require more consideration. It includes a total of 338 crossings, of which 271 are watercourse crossings. There are few A and B roads which could provide direct access to the route corridor. This could increase the lengths of temporary haul road required for construction traffic. In addition, there are a number of constraints which present obstacles to construction access such as Steeping River, River Witham, Boston to Nottingham railway and South Forty Foot Drain.

4.3.4 The Orange Route Corridor avoids settlements and scattered individual properties for the majority of its length but in a few places is in closer proximity to them including at Orby, Bratoft and Great and Little Steeping where the settlements are located immediately adjacent to the route corridor. There is also a pinch point where the corridor narrows significantly north of Welton le Marsh. By avoiding settlements as much as possible disturbance during construction can be reduced.

4.3.5 The Orange Route Corridor generally avoids the majority of designated environmental sites or interests. In avoiding Gunby Hall, a Registered Park and Garden and its surrounding estate the

Orange Route Corridor includes an option through the AONB for approximately 3 km. In developing a detailed route within the AONB consideration will need to be given to the landscape features which contribute to the site’s designation such as woodland and hedgerows. The majority of features are considered to be avoidable such that in the long term a cable route developed within the Orange Route Corridor is not expected to result in any long term impacts on landscape character.

4.3.6 The alternative route provided by the Orange Route Corridor is routed through the north western part of the Burgh le Marsh Target Area of the LCGMP. Routeing through this area would require more detailed consideration of the feasibility of mitigation options including reinstatement. The Orange Route Corridor also cannot avoid non-designated heritage assets due to their number and distribution. Subject to detailed routeing taking into account the relationship of these sites with other designated heritage interests, as well as other factors, site specific mitigation would be required including pre-construction archaeological investigations.

4.4 Summary of final route corridor options

4.4.1 Table 4.1 below provides a summary of the Purple and Orange Route Corridors including key routeing constraints and opportunities identified for both through technical and environmental assessments.

Table 4.1 Route Corridor Options – Summary of Assessment			
Key Routeing Consideration	Purple Route Corridor (RCA, RCD and RCE)	Orange Route Corridor (RCB, RCD and RCE)	Comparative Considerations
Total Length (based on maximum)	63.8 to 63.9 km	63.2 to 67.4 km	Both route corridors are similar in overall length. The longest option is formed by the Orange Route Corridor where it is routed to the east and south of Gunby Hall and the surrounding estate land. The shortest option is the Orange Route Corridor where it is routed through the AONB.
Approx. no. of Crossings (based on maximum)	Up to 221 crossings of roads, watercourses or other infrastructure.	Up to 338 crossings of roads, watercourses or other infrastructure.	Both route corridors require a significant number of crossings including watercourses, field drains, roads and other infrastructure. Overall the Purple Route Corridor requires fewer crossings as the eastern part of the route is required to cross far fewer watercourses.

Table 4.1 Route Corridor Options – Summary of Assessment

Key Routeing Consideration	Purple Route Corridor (RCA, RCD and RCE)	Orange Route Corridor (RCB, RCD and RCE)	Comparative Considerations
Constructability	<p>Predominantly open agricultural land with sufficient space available to facilitate construction including opportunities for siting temporary construction facilities subject to consideration of other constraints.</p> <p>Potentially challenging topography is present in localised areas such as the steep slopes around Langton and Sutterby however, slopes with evidence of historic landslips could be avoided during detailed routeing.</p>	<p>Predominantly open agricultural land with sufficient space available to facilitate construction including opportunities for siting temporary facilities subject to the consideration of other constraints. Access is constrained by linear settlements around Orby, Burgh le Marsh, Irby in the Marsh and Great Steeping.</p> <p>Potentially challenging ground conditions are present with some localised peat deposits present to the west of Little Steeping.</p>	<p>Both Route Corridors would accommodate the construction works and facilities required to install the cables albeit with some restrictions in localised areas. Should a route be developed within the AONB, no temporary facilities would be located within the designation.</p> <p>Steep slopes in localised areas of the Purple Route Corridor would require careful routeing and consideration of construction methods. The combination of environmental constraints and linear developments would require careful routeing in areas of the Orange Route Corridor. These latter areas could be avoided by selecting the western corridor in RCB. The Orange Route Corridor would also have the potential to encounter peat which could present difficult ground conditions during construction.</p>

Table 4.1 Route Corridor Options – Summary of Assessment

Key Routeing Consideration	Purple Route Corridor (RCA, RCD and RCE)	Orange Route Corridor (RCB, RCD and RCE)	Comparative Considerations
Infrastructure	<p>Relatively small number of road crossings (A, B and minor roads) required.</p> <p>Crossings of operational railway lines have been avoided with the exception of the Boston to Nottingham railway north of the approach to the preferred converter station.</p> <p>Utility crossings potentially include an Anglian Water pipeline, a natural gas pipeline, the proposed Heckington Wind Farm electrical connection (buried cable) and the proposed Triton Knoll onshore cable route (subject to detailed routeing).</p>	<p>Crosses fewer A and B roads but higher number of minor road crossings required.</p> <p>Crossings of operational railway lines have been avoided with the exception of the Boston-Nottingham railway north of the approach to the preferred converter station.</p> <p>Utility crossings include two natural gas pipelines, an Anglian Water pipeline, the proposed Heckington Wind Farm electrical connection (buried cable) and the proposed Triton Knoll onshore cable route (subject to detailed routeing).</p>	<p>Whilst the Orange Route Corridor crosses fewer A and B roads than the Purple Route Corridor it requires more road crossings in total due to the number of minor roads to be crossed. Based on available information, the Purple Route Corridor requires more crossings of other utilities. Both Route Corridors would require a crossing of the Boston to Nottingham railway. Subject to other factors it is preferable to reduce the total number of crossings required as much as possible, however, no insurmountable crossing constraints have been identified.</p>

Table 4.1 Route Corridor Options – Summary of Assessment

Key Routing Consideration	Purple Route Corridor (RCA, RCD and RCE)	Orange Route Corridor (RCB, RCD and RCE)	Comparative Considerations
Accessibility	<p>The eastern part of the route corridor has good access options with a number of A and B roads offering relatively direct construction access from the existing road network. The west of the route corridor is comparatively more constrained with less frequent A and B roads.</p> <p>Potential obstacles to construction access include the River Witham, Boston to Nottingham railway and South Forty Foot Drain.</p>	<p>The Orange Route Corridor is more constrained as there are less A and B roads and fewer opportunities for direct construction access from the existing road network.</p> <p>Potential obstacles to construction access include the Steeping River (due to flood defence banks); River Witham, Boston to Nottingham railway and South Forty Foot Drain.</p>	<p>Overall, the Purple Route Corridor is better served by the existing road network offering relatively good opportunities for construction access, particularly in the east of the corridor although steep slopes could constrain access in localised areas. The Orange Route Corridor has more sections where the local road network is less suitable for construction access and potentially more obstacles to construction access.</p>

Table 4.1 Route Corridor Options – Summary of Assessment

Key Routing Consideration	Purple Route Corridor (RCA, RCD and RCE)	Orange Route Corridor (RCB, RCD and RCE)	Comparative Considerations
Settlement, Community & Tourism	<p>The majority of settlements and scattered individual properties along the route corridor are avoided. The eastern part of the corridor is generally more settled with a larger number of small towns and villages present in the vicinity. There is the potential for some temporary short term disturbance during construction such as noise, visual impact or traffic but this could be further reduced through more specific mitigation. Visitor attractions close to and/or within the route corridor include Sandilands Golf Course, Lincolnshire Coastal Country Park (LCCP), Lincolnshire Wolds AONB as well as various Public Rights of Way (PROW). Through a combination of routing and selection of installation methods no direct impacts are likely, however, some temporary short term disturbance may be possible.</p>	<p>There are more settlements present along the eastern parts of the route corridor including some which are located adjacent to the corridor. The section of the route corridor which runs south/south west from the landfall to Hasthorpe crosses a number of minor roads which connect coastal settlements. There is the potential for some temporary short term disturbance during construction such as noise, visual impact or traffic but this could be further reduced through more specific mitigation. Visitor attractions close to and/or within the route corridor include Sandilands Golf Course, LCCP and Gunby Hall as well as various PROW. No direct impacts are likely, however, some temporary short term disturbance may be possible.</p>	<p>The Purple and Orange Route Corridors both avoid settlements for the majority of their lengths, however, in some places the Orange Route Corridor is in closer proximity to relatively large settlements (for example Orby and Welton le Marsh). For both corridor options some temporary short term disturbance during construction is likely, however, this is considered to be mitigable.</p> <p>There are a number of visitor interests which are common to both route corridors however, the key differentiators are the AONB potentially affected by the Purple and Orange Route Corridors and Gunby Hall with the surrounding estate potentially affected by the Orange Route Corridor only. As above for both options some temporary short term disturbance to visitors may be possible.</p>

Table 4.1 Route Corridor Options – Summary of Assessment

Key Routing Consideration	Purple Route Corridor (RCA, RCD and RCE)	Orange Route Corridor (RCB, RCD and RCE)	Comparative Considerations
Geology & Hydrogeology	The geological constraints which are present are either avoidable in developing a detailed route or may inform the installation methods used.	The development of a detailed cable route within the Orange Route Corridor is not constrained by the underlying geology.	Both route corridors avoid similar constraints. Both corridors also include sections routed through groundwater Special Protection Zones (SPZs), however, this is not considered to be a routing constraint.
Hydrology	Up to 168 watercourse crossings are required. The route corridor is elevated in the eastern section requiring less watercourse crossings. The western part of the route corridor is routed through lower lying and more heavily drained agricultural land requiring a significant number of crossings of field drains.	Up to 271 watercourse crossings. The eastern section is routed through low lying coastal plains and the western section through more heavily drained agricultural land. A section of the eastern part of the route corridor runs perpendicular/part perpendicular to the main catchment flows which could increase disturbance of drainage during construction works.	Whilst both route corridors require a significant number of watercourse crossings the Orange Route Corridor requires a higher number overall. This is due to the increased number of watercourses crossed by the eastern part of the route corridor where it crosses through flatter low lying coastal plains in the east. For either route corridor a detailed watercourse crossing strategy will be needed to inform mitigation requirements.
Agriculture & Soils	Land use is dominated by agriculture. The majority of the Purple Route Corridor is underlain by Best and Most Versatile (BMV) agricultural land.	Land use is dominated by agriculture. The majority of the Orange Route is underlain by BMV agricultural land.	Both routes are underlain by BMV agricultural land for the majority of their length, however, the eastern part of the Purple Route Corridor is underlain by slightly less BMV than the eastern part of the Orange Route Corridor. Some temporary disturbance of agricultural land would occur during installation for both options. Specific mitigation requirements would be tailored according to the route corridor to ensure effective management, handling and storage of soil so that in the long term agricultural land use can resume.

Table 4.1 Route Corridor Options – Summary of Assessment

Key Routing Consideration	Purple Route Corridor (RCA, RCD and RCE)	Orange Route Corridor (RCB, RCD and RCE)	Comparative Considerations
Landscape	Subject to detailed routeing, up to 8 km of the route corridor is through the Lincolnshire Wolds AONB.	Subject to detailed routeing, up to 3 km of the route corridor is through the Lincolnshire Wolds AONB. The Orange Route Corridor also provides the opportunity to avoid the AONB however, this requires a longer overall corridor in closer proximity to and potentially impacting on other constraints. The selection of a route corridor option would require balancing the potential impacts on the AONB with those on settlements, ecological and heritage interests outside of the AONB.	Both route corridors have the potential to impact on the AONB. The Purple Route Corridor requires a longer section through the AONB and could be considered to be potentially more impacting, however, that does not take account of the opportunities to mitigate through detailed routeing and to avoid sensitive features as well as landscape reinstatement or enhancement. Long term impacts on the AONB could be prevented for both the Purple and Orange Routes Corridors but in selecting a route through the AONB over the alternative which avoids it (Orange Route Corridor) would require to be justified taking into account the requirements of the National Planning Policy Framework (NPPF).
Ecology	There are no major ecological constraints present within or immediately adjacent to the Purple Route Corridor.	The Orange Route Corridor largely avoids major ecological constraints, however, routeing the corridor to avoid the AONB would result in direct impacts on the Burgh le Marsh Target Area of the LCGMP.	Both the Purple and Orange Route Corridors largely avoid ecological designations. The exception to this, subject to detailed routeing, is the Orange Route Corridor assuming a route avoiding the AONB is preferred. This route would be more ecologically impacting than the Purple Route Corridor due to direct impacts on the Burgh le Marsh Target Area of the LCGMP. Dependent on the extent of the route within the LCGMP, the impacts on it may be partly mitigated through habitat reinstatement.

Table 4.1 Route Corridor Options – Summary of Assessment

Key Routing Consideration	Purple Route Corridor (RCA, RCD and RCE)	Orange Route Corridor (RCB, RCD and RCE)	Comparative Considerations
<p>Archaeology & Heritage</p>	<p>Avoids directly impacting on designated heritage assets. Non-designated heritage assets cannot all be avoided due to the number and distribution, particularly to the east of the route corridor. These assets range from small find spots to crop marks to ridge and furrow field systems.</p>	<p>Avoids directly impacting designated heritage assets. It has been routed to avoid as much as possible, Gunby Hall and the surrounding estate, however, a number of non-designated assets cannot be avoided.</p>	<p>Designated and non-designated heritage assets are present throughout both the Purple and Orange Route Corridors. For both options, designated assets are avoidable through the application of a minimum 50 m separation distance, however, impacts on non-designated assets may not be avoided due to the high number and distribution of those which are present. Impacts on these assets would require site specific mitigation. Whilst direct impacts on non-designated assets will in some cases be unavoidable, in developing a detailed route an important consideration will be avoiding clusters of assets of similar periods where possible.</p>

5 Next steps

5.1 Public consultation

- 5.1.1 The next stage in the development of the UK Onshore Scheme is to identify the most appropriate route corridor for the underground high voltage DC cables between the preferred landfall and the converter station sites.
- 5.1.2 NGVL will consult on the Purple and Orange Route Corridors. The consultation feedback will be used to help identify a preferred route corridor and inform the development of a detailed route within it. Phase 2 consultation will take place from 5 September to 14 October 2016 (inclusive).

Public events

- 5.1.3 Public consultation events will be held during the Phase 2 Consultation at locations close to the Purple and Orange Route Corridors. Ten events will be held in the locations set out in Table 5.1. Consultation zones have been identified in vicinity of the route corridors, and residents and businesses within the zones will be invited to take part in the consultation process and encouraged to attend the consultation events. Statutory stakeholders, local authorities, parish and town councils, and other community and stakeholder groups will also be invited to take part in the consultation.
- 5.1.4 Details for the public events are as follows:

Table 5.1 Public Consultation Events		
Venue	Date	Time
Bicker Village Hall	Wednesday 7 September	2:00pm- 8:00pm
Sandilands, Grange & Links Hotel	Thursday 8 September	2:00pm-8:00pm
Donington, The Ruby Hunt Centre	Friday 9 September	2:00pm-8:00pm
Stickney Village Hall	Saturday 10 September	12:00pm-4:30pm
Orby Village Hall	Wednesday 14 September	2:00pm-8:00pm
Helpringham Memorial Hall	Thursday 15 September	2:00pm-8:00pm
Alford Corn Exchange	Friday 16 September	2:00pm-8:00pm
Little Steeping Village Hall	Thursday 22 September	2:00pm-8:00pm
Partney, Dalby & Dexthorpe Victory Hall	Monday 3 October	2:00pm-8:00pm
Hubberts Bridge Community Centre	Tuesday 4 October	2:00pm-8:00pm

- 5.1.5 Each event will consist of a set of exhibition boards setting out details of the project, along with information about the routing process, how underground cables are installed and details of the Purple and Orange Route Corridors, including images, diagrams and maps. Members of the project team will be available to talk through the project with attendees and answer questions. Feedback forms will be available for attendees to give their views on the information they have been provided and to let the project team know if there are other considerations which they feel should be taken into account.

5.2 Next Steps

- 5.2.1 Following the Phase 2 Consultation, the feedback received from consultees will be collated and analysed by the project team. The feedback will be considered, along with analysis from technical and environmental assessments, when deciding on a preferred route corridor and developing a detailed route alignment.
- 5.2.2 The feedback responses, analysis and conclusions will be published in a consultation feedback report towards the end of the year. The report will outline how the feedback from the Phase 2 Consultation has influenced NGVL's choice for its preferred route and converter station design.
- 5.2.3 This feedback report, along with the Phase 1 Consultation feedback report will form the basis of the final Consultation Report which will be submitted to the local planning authorities as part of the Viking Link planning applications.

List of abbreviations

AC	Alternating Current
AONB	Area of Outstanding Natural Beauty
AOD	Above ordnance datum
BMV	Best and Most Versatile
CS	Converter Station
DC	Direct Current
EU	European Union
GB	Great Britain
HER	Historic Environment Record
km	Kilometres
kV	Kilo Volts
LCGMP	Lincolnshire Coastal Grazing Marsh Project
LCCP	Lincolnshire Coastal Country Park
LF	Landfall
LWS	Local Wildlife Sites
m	Metres
MSA	Mineral Safeguarding Area
MW	Megawatt
NGET	National Grid Electricity Transmission Limited
NGVL	National Grid Viking Link Ltd
NPPF	National Planning Policy Framework
PROW	Public Right of Way
RCA	Route Corridor A
RCB	Route Corridor B
RCC	Route Corridor C
RCD	Route Corridor D
RCE	Route Corridor E

SSSI	Sites of Special Scientific Interest
SPZ	Special Protection Zone
TJP	Transition Joint Pit
UK	United Kingdom
WPD	Western Power Distribution

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