YG-DCO-053

# Yorkshire Green Energy Enablement (GREEN) Project

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# Contents

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# Executive summary

## Purpose of this report

This Design and Access Statement (DAS) has been prepared to accompany an application by National Grid Electricity Transmission plc (National Grid) for a Development Consent Order (DCO) under Section 37 of the Planning Act 2008[1] (the Act) for the Yorkshire Green Energy Enablement (GREEN) Project ("the Project" or "Yorkshire GREEN").

The purpose of this DAS is to describe the design of the permanent elements of the Project. The DAS sets out the background to the Project, how the Project will be accessed and National Grid's approach to and development of good design.

Chapter 3 of this DAS considers the policy context for the consideration of design issues, focusing on the Overarching National Policy Statement for Energy (EN-1) and the National Policy Statement for Electricity Networks Infrastructure (EN-5) Those policy documents emphasise the importance of good design, whilst recognising the importance of the functional requirements and physical constraints which apply to a linear infrastructure project of this nature.

The DAS sets out a summary of National Grid's approach to good design and demonstrates how National Grid has responded to the physical, environmental and socio-economic context of the overhead line route and cable end sealing compound and substation locations and responded to consultation to define the Project (including public exhibitions as set out in the Consultation Report, **Volume 6, Document 6.1**). The approach which National Grid has adopted accords with the requirements of EN-1 and EN-5.

The design evolution of the Project has been an iterative process. National Grid has looked at ways to achieve good design by investigating alternative options and solutions throughout the proposed route for the Project (as set out in ES **Chapter 2: Project need and alternatives, Volume 5, Document 5.2.2**). This DAS seeks to illustrate the design approach adopted by National Grid from project inception through to Draft DCO. The DAS seeks to identify why particular design options have been selected as preferred over other options, and demonstrates how the design development process has included comprehensive consideration of consultation feedback, with design changes being incorporated into the design where practical and beneficial.

There is very limited scope to alter the design and physical appearance of the pylon type selected for this Project (steel lattice design) due to their operational restrictions and requirements, and given that the Project creates a connection between two overhead lines that already use steel lattice pylons. This is in accordance paragraph 2.8.2 of NPS EN-5 and National Grid's Approach to Consenting (**Volume 5, Document 5.3.2B**) where an assumption is made that overhead steel lattice pylons will be adopted as part of the Project.

As a result, Chapter 6 of the DAS provides a description of the design development for the core elements of the Project focusing primarily on the:

- Cable Sealing End Compounds (CSECs) at Shipton and Tadcaster; and

[1] UK Government (2008). The Planning Act 2008 c. 29. (online) Available at: https://www.legislation.gov.uk/ukpga/2008/29/contents (Accessed October 2022).

- New substations at Overton and Monk Fryston.

This DAS reports the design evolution and alternative options which have been considered through the iterative design of the Project and in particular seeks to demonstrate how National Grid has sought to satisfy the requirements of good design identified in EN-1 and EN-5.

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# Design and Access Statement

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# 1 Introduction

1.1.1 This Design and Access Statement (DAS) has been prepared to accompany an application by National Grid Electricity Transmission Ltd (National Grid) for a Development Consent Order (DCO) under Section 37 of the Act[1] (as amended by the Localism Act 2011[2]) (the Act) for a new electricity transmission connection known as the Yorkshire Green Energy Enablement (GREEN) Project (referred to as 'the Project' or Yorkshire GREEN).

1.1.2 The Project is sited within Yorkshire, with the most northerly components located approximately 1.5km north-east of the village of Shipton-by-Beningbrough and approximately 10km north-west of York city centre. The most southerly components are at the existing Monk Fryston Substation, located to the east of the A1 and immediately south of the A63.

1.1.3 The Project is divided into six sections for ease of reference as indicated in **Figure 1.2, Volume 5, Document 5.4.1** of the ES (**Volume 5, Document 5.2**). In summary, Yorkshire GREEN comprises the following new infrastructure within the Order Limits, within which all works for which development consent is being sought would take place:

- **Section B (North West of York Area):**
  - Shipton North and South 400kV cable sealing end compounds (CSECs) and 230m of cabling;
  - the 2.8km YN 400kV overhead line (north of proposed Overton Substation);
  - Overton 400/275kV Substation; and
  - two new sections of 275kV overhead line south of Overton Substation: the XC 275 kV overhead line to the south-west (2.1km) and the SP 275kV overhead line to the east (1.5km);
- **Section D: (Tadcaster Area)** Tadcaster Tee West and East 275kV CSECs, and 350m of cabling; and
- **Section F: (Monk Fryston Area)** Monk Fryston 400kV Substation (adjacent to the existing substation).

1.1.4 Works to existing infrastructure within the Order Limits would comprise:

- **Section A (Osbaldwick Substation):** Minor works at Osbaldwick Substation comprising the installation of a new circuit breaker and isolator along with associated cabling, removal and replacement of one gantry and works to one existing pylon. All substation works would be within existing operational land.
- **Section B (North West of York Area):** Reconductoring of 2.4km of the 2TW/YR 400kV overhead and replacement of one pylon. A mixture of decommissioning, replacement and realignment of 5km of the existing XCP 275kV Poppleton to Monk Fryston overhead line between Moor Monkton and Skelton. To the south and south-east of Moor Monkton the existing overhead line would be realigned up to 230m

[2] UK Government (2011). The Localism Act 2011 c. 20. (online) Available at: https://www.legislation.gov.uk/ukpga/2011/20/contents/enacted (Accessed October 2022).

south from the current overhead line and the closest pylon to Moor Monkton (340m south-east) would be permanently removed. A 2.35km section of this existing overhead line permanently removed between the East Coast Mainline (ECML) Railway and Woodhouse Farm to the north of Overton.

- **Section C (Moor Monkton – Tadcaster** - existing 275kV overhead line north of Tadcaster (Section D)): Reconductoring works to the existing XC Monk Fryston to Poppleton overhead line south of Moor Monkton and north of Tadcaster.
- **Section D (Tadcaster Area):** Replacement of one pylon on the Tadcaster Tee to Knaresborough (XD) 275kV overhead line route.
- **Section E (Tadcaster – Monk Fryston** - existing 275kV overhead line south of Tadcaster (Section D)). Reconductoring works to the existing XC Monk Fryston to Poppleton overhead line south of Tadcaster and north of Monk Fryston.
- **Section F (Monk Fryston Area):** Reconfiguration of the existing XC Monk Fryston to Poppleton overhead line at its southern end to connect into the new substation at Monk Fryston; Reconfiguration of the Monk Fryston to Eggborough 400kV 4YS overhead line to connect into the new substation at Monk Fryston.

## 1.2 Purpose of this Design and Access Statement

1.2.1 This DAS is one of a suite of supporting documents submitted as part of the application for development consent for the Project. Given the nature of the Project, no public access to the proposed infrastructure is permitted. As a result, access considerations that apply to other developments, such as inclusive design and movement through buildings and sites, are not applicable to this Project. In terms of vehicular access, there will be permanent accesses at Shipton CSEC's, Overton Substation, Tadcaster CSEC's and Monk Fryston Substation providing a right of access for on-going for maintenance when required. All other accesses are temporary and for the construction phase only. Locations for access points have been carefully considered and further detail on this can be found in **ES Chapter 12: Traffic and Transport** (**Volume 5, Document 5.2.12**) and the **Construction Traffic Management Plan (CTMP)** (**Volume 5, Document 5.3.3F**). This DAS is therefore submitted to inform the consideration of the application with regard to design matters only.

1.2.2 Whilst there is no statutory requirement for a DAS to be produced to accompany a DCO, Paragraph 4.5.4 of EN-1 states that:

*"applicants should be able to 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. In considering applications the IPC 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."*

1.2.3 In light of this, it is considered that a DAS will assist the Secretary of State for Business, Energy and Industrial Strategy (SoS) in the determination of the application by clearly setting out the design evolution of the Project.

1.2.4 PINS Advice Note 6 (Preparation and Submission of Application Documents[3]) advises that 'other documents' may include information that the applicant chooses to support the application. It cites a number of examples, including a Planning Statement and DAS. This DAS is supplied by National Grid to assist in the understanding of how the Project design process has evolved.

1.2.5 The nature of many types of energy infrastructure will limit the extent to which it can contribute to the enhancement of the quality of the area. Paragraph 4.5.1 of EN-1 (Department for Energy and Climate Change (DECC), 2011) details the criteria for 'good design' for energy infrastructure. It states that:

*"applying "good design" to energy projects should produce sustainable infrastructure sensitive to place, efficient in the use of natural resources and energy used in their construction and operation, matched by an appearance that demonstrates good aesthetic as far as possible."*

1.2.6 This DAS is provided to demonstrate how National Grid has taken into account the criteria for good design contained within EN-1 and EN-5. This DAS describes the design of the connection between Osbaldwick and Monk Fryston and the various components of associated development in a proportionate way. The document also explains the ways in which the design of the Project has evolved.

## 1.3 DAS requirements

1.3.1 As stated earlier, there is no specific statutory requirement for a DAS for applications for development consent under the Act[1]; however, Regulation 5(2)(q) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (APFP Regulations)[4] does provide for any other documents considered necessary to support the application to accompany it. In addition, section 10 'Sustainable development' of the Act (subsection (3)(b)) states that in setting policy for NSIPs (through National Policy Statements), the SoS must have regard to the desirability of achieving 'good design'[1].

1.3.2 In the absence of any further guidance on the use of DAS in applications under the Act[1], reference has been made to the requirements that apply to a DAS prepared for planning applications under the Town and Country Planning Act 1990[5]. These are set out in Part 3, Article 9 of the Town and Country Planning (Development Management Procedure) (England) Order 2015 (DMPO). In summary these requirements seek that a DAS should explain the design principles that have been applied to the development, the steps taken to appraise the context, the policy for access, the consultation that has taken place in relation to access, and how specific issues relating to access have been taken

[3] The Planning Inspectorate (undated). Advice Note Six: Preparation and Submission of Application Documents. Version 11. (online). Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-six-preparation-and-submission-of-application-documents/ (Accessed October 2022).
[4] UK Government (2009). The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 SI 2009 No. 2264 (online). Available at: https://www.legislation.gov.uk/uksi/2009/2264/contents/made (Accessed October 2022).
[5] UK Government (1990). The Town and Country Planning Act 1990 c.8 (online) Available at: https://www.legislation.gov.uk/ukpga/1990/8/contents (Accessed October 2022).

into account. (Access matters are dealt with above in paragraph 1.2.1). Guidance[6] on the production of DAS suggests that it is helpful to structure the description of the proposals under the headings of: use, amount, layout, scale, landscaping, appearance and access. As an approach this particular formula is considered more suitable to a residential or commercial proposal rather than a major linear infrastructure proposal where there is a need to respond to existing operational layouts as well as specific project-wide functional requirements.

1.3.3 Therefore, this DAS does not address these seven themes under separate headings; instead they are embedded into the description of the core elements of the Project i.e. 400kV connection, 275kV connection, Overton Substation, Monk Fryston Substation, and the CSECs where appropriate. The physical, social, economic and planning policy context assessments are not explicitly identified in the DAS, but instead are set out in the **Planning Statement** (**Volume 7, Document 7.1**); however key themes are drawn out where possible. Once constructed, National Grid would only require infrequent access to ensure the Project could be adequately maintained. Access would be typically made by foot, 4x4 or tractor and trailer.

1.3.4 This DAS therefore:

- explains the legislative, policy and physical context within which the design proposals have evolved and the way in which that context has influenced the final proposals;
- sets out design principles applied by National Grid and summarises its approach to good design; and
- describes the proposals in a structured, accessible way and explains the way in which they have been influenced by consultation and how they have been informed by the design principles.

1.3.5 This DAS should be read in conjunction with the plans submitted with the **draft DCO (Volume 3, Document 3.1**), the **Environmental Statement** (ES) (**Volume 5**), the **Consultation Report** (**Volume 6, Document 6.1**) and the **Planning Statement** (**Volume 7, Document 7.1**). The design of the Project has been informed by the design principles which are set out in this DAS. The **draft DCO (Volume 3, Document 3.1**) contains a number of proposed requirements to be attached to an approval. The purpose of the DCO requirements is to ensure that all subsequent detailed design work complies with the parameter plans and design principles (see Requirement 3 relating to design drawings and Requirement 8 relating to landscape mitigation planting).

## 1.4 Parameters for implementation

1.4.1 The DAS describes the design principles which will be adopted throughout the implementation of the Project. There is always the necessity for some flexibility and for the reservation of some details to be provided later, for example because previously unidentified poor ground conditions may require a pylon to be re-sited slightly for geotechnical reasons or there may be a need to deviate vertically upwards to maintain sufficient ground clearance due to localised constraints. This will be facilitated through the Limits of Deviation (Article 5, Part 2, of the **draft DCO** (**Volume 3, Document 3.1**).

[6] The Commission for Architecture and the Built Environment (2006). Design and Access Statements: How to write, read and use them. The Commission for Architecture and the Built Environment; London.

1.4.2 The proposed designs which are submitted as part of the DCO application represent the culmination of extensive design development, consultation and engagement with a wide range of stakeholders (please **see Consultation Report, Volume 6, Document 6.1**).

1.4.3 Case law relating to EIA (established through R. v Rochdale MBC ex parte Milne (No.1) and R v Rochdale MBC ex parte Tew (1999) and R. v Rochdale MBC ex parte Milne (No.2) (2000))[7] recognises the need for flexibility in project design, which can be addressed through the use of a "Design Envelope" also known as a "Rochdale Envelope." The Design Envelope describes the relevant parameters within which the Project will operate. The Planning Inspectorate has produced Advice Note 9[8] on the Rochdale Envelope.

1.4.4 The limits of deviation (LoD) identify a maximum distance or measurement of variation within which the works for the Project must be constructed.

1.4.5 The proposed LoD for the overhead line are shown on the **Works Plans** (**Volume 2, Document 2.6**) and for Overton Substation and the CSECs are shown on the parameter plans as part of the **Design Drawings (Volume 2, Document 2.15)** and are required for:

- new overhead lines (400kV YN north of Overton 400/275kV Substation, new sections of 275kV overhead line south of Overton 400/275kV Substation (XC and SP overhead lines), and the 400kV 4YS overhead line entries to Monk Fryston Substation lateral limits: up to 100m lateral LoD (50m either side of the proposed overhead line centre line);
- temporary overhead line diversions lateral limits: up to 100m lateral LoD (50m either side of the proposed temporary overhead line centre line);
- overhead line vertical limits (all new overhead lines, pylons and temporary overhead line diversions): proposed pylon heights (cross ref to be added to appendix with pylon schedules) up to 6m vertical LoD;
- CSEC: up to 25m lateral LoD around the edge of each CSEC;
- Overton 400/275kV Substation (lateral LoD): up to 20m lateral LoD from the east, south and west of the substation boundaries and up to 10m lateral LoD from the north boundary; and
- Overton Substation and proposed Monk Fryston 400kV Substation (vertical LoD): No vertical LoD is proposed but both substations would not exceed 15m in height above the finished ground level.

1.4.6 The proposed lateral LoD are not fixed along the entirety of the overhead lines but deviate depending on constraints that are present along the route. In some locations, the LoD have been reduced to avoid the loss of, or impacts on, trees, such as veteran trees, woodland and other environmentally sensitive receptors. Lateral and vertical limits of deviation are designed to allow for localised constraints or unknown or unforeseeable issues that may arise during construction and which would require a

[7] R. v Rochdale Metropolitan Borough Council ex parte Milne (No. 1) (1999) 5 WLUK 67 R. v Rochdale Metropolitan Borough Council ex parte Tew (1999) 3 PLR 74 R. v Rochdale Metropolitan Borough Council ex parte Milne (No. 2) (2000) 7 WLUK 955

[8] Planning Inspectorate (2018). Advice Note Nine: Rochdale Envelope. (version 3). (online) Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-nine-rochdale-envelope/ (Accessed October 2022).

minor adjustment to the overhead line or underground cable design and the pylon positions.

## 1.5 Mitigation measures

1.5.1 If National Grid is granted consent for the Project its powers under the DCO would apply to specified land within the 'Order Limits' as shown on the plans submitted with the application. The Project would include embedded landscaping mitigation measures (please see the **Embedded Measures Schedule, Volume 5, Document 5.3.3A)** that National Grid would implement in accordance with the DCO and within the 'Order Limits'. The obligation to carry out these embedded mitigation measures which include site specific landscaping proposals at Overton Substation, the Tadcaster CSECs and at Monk Fryston Substation, which would be secured by the Requirements set out in the draft DCO **Volume 3, Document 3.1**).

## 1.6 DAS structure

1.6.1 This DAS is structured as follows:

- **Chapter 2: Project Overview** – provides an introduction to National Grid, outlines the need for the Project and provides an outline of the elements comprising the Project;
- **Chapter 3: Legislation and Policy Context** – provides an overview of legislation, NPS, development plan and National Grid Policies which are considered to be of relevance to the design of the Project;
- **Chapter 4: Physical Context** – provides a summary of the route corridor and key features along the route;
- **Chapter 5: National Grid's Design Principles** – summarises National Grid's Design Principles;
- **Chapter 6: Development Proposals** – describes the components of the Project summarising how the design and location have been informed by the Design Principles; and
- **Chapter 7: Conclusion** – demonstrates how the Project has sought to achieve a high standard of design whilst also satisfying the requirements of the NPS in terms of good design and operational and technical requirements.

# 2 Overview of the Project

## 2.1 National Grid

2.1.1 National Grid is the operator of the high voltage transmission system for the whole of Great Britain and the owner of the high voltage transmission network in England and Wales. The system operates mainly at 400,000 (400kV) and 275,000 volts (275kV), connecting the electricity generators to substations where the high voltages are transformed to lower voltages, enabling the power to be distributed to homes and businesses by Distribution Network Operators (DNO) who operate at a maximum of 132,000 volts. National Grid has duties placed upon it by the Electricity Act 1989 (as amended) (the Electricity Act[9]) and operates under the terms of its transmission licence.

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

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

2.1.3 This means that, when considering how best to provide transmission capacity, it should do so in a co-ordinated manner by considering all potential development which may interact with the current requirement.

2.1.4 Section 38 and Schedule 9 of the Electricity Act[9] requires National Grid, when formulating proposals for new lines and new works to *"...have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest; and shall do what (it) reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects."*

2.1.5 National Grid has an obligation under its transmission licence to provide a connection to the transmission system in response to each valid application made. In summary, where any applicant applies for a connection, National Grid must 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.

2.1.6 Condition C17 of the transmission licence (Transmission system security standard and quality of service) requires National Grid to *"at all times: plan develop and operate the*

[9] UK Government (1989). The Electricity Act 1989 c.29. (online) Available at: https://www.legislation.gov.uk/ukpga/1989/29/contents (Accessed October 2022).

*licensee's transmission system....In accordance with the National Electricity Transmission Security and Quality of Supply Standard Version 2.1"* (NETS SQSS).

2.1.7 The NETS SQSS is a document that defines criteria which specify the robustness of the transmission system, in terms of the faults, and combination of faults, that it must be able to withstand without any interruption of supplies, and the maximum interruption to supplies which is permitted for certain more onerous combination of faults.

## 2.2 The need for the Project

2.2.1 In line with the UK government's legal commitment to reduce greenhouse gas emissions by at least 100% of 1990 levels (net zero) by 2050, growth in offshore wind generation and interconnectors to Europe has seen a significant number of connections planned in Scotland and coastal areas of the North of England.

2.2.2 The existing electricity transmission network was not designed to transfer the current and increasing volume of generation capacity from the North to major centres of electricity demand which continue to exist in central and southern England. The network will require significant reinforcement in the Yorkshire area to provide capacity for these connections and customers to ensure that power can be transferred securely to onshore demand centres in the south to meet the needs of Great Britain electricity consumers.

2.2.3 National Grid has obligations under its Transmission Licence to provide an efficient, economic and co-ordinated transmission system in England and Wales. National Grid is required at all times to plan and develop the transmission system in accordance with the National Electricity Transmission System Security and Quality of Supply Standard (NETS SQSS) and to offer connections to and/or use of the transmission system via the National Grid Electricity System Operator (ESO).

2.2.4 The growth in generation and interconnectors to Europe and rising transfers of onshore and offshore wind from Scotland, alongside connections in the northern regions of England, means that by 2027, boundaries B7, B7a and B8 of the transmission system will exceed their current capacity.

2.2.5 This assessment is supported by both the Network Options Assessment (NOA) and the Future Energy Scenarios (FES) which are undertaken by the Electricity System Operator, independently of National Grid as the transmission owner. The FES identified that from 10,000 MW to between 20,000 MW to 30,000 MW is required in increased capacity by 2040 driven by generation to achieve NET ZERO targets.

2.2.6 The National Grid (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. When constraint costs become higher than the cost of investment required to reinforce the network (and remove the need for constraint costs) it is considered right to proceed with investment for reinforcement. Without reinforcement by 2027 there can be no further unconstrained connections above boundary B8.

2.2.7 In addition, the following three contracted customers have connection offers which are reliant on reinforcement of the network:

- Continental Link – A 1.8GW Interconnector between England and Norway to connect in the Creyke Beck Substation, close to Hull, by 2027

- The Atlantic Superconnection - A 1GW Interconnector from Iceland expected to connect in the Creyke Beck Substation, close to Hull, by 2027
- Hornsea Offshore P4 - 2 phased connection application for 2.6GW (1.5GW in 2027 and 1.1GW in 2028) of offshore wind generation with an offer to connect in the North East in April 2027 and October 2028 for each phase respectively.

2.2.8 Establishing the need for reinforcement, as summarised above, is the first step in National Grid's project development process. For the Project, this is detailed in the **Need Case** (**Volume 7, Document 7.4**). On the basis of the need case established, National Grid review how the required reinforcement could be delivered, considering different strategic options, and assessing the options identified. This takes into account environmental, socio-economic, cost and technical considerations. The strategic proposal is then considered further through options identification and selection, taking into account feedback received. The design and assessment of the project in environmental terms is the subject of statutory consultation, with feedback considered, before the project taken forward is finalised and submitted in the DCO application.

## 2.3 Description of the 400kV/275kV overhead line technology to be used for Yorkshire GREEN

2.3.1 National Grid transmits electricity at a high voltage in order to reduce loss of energy. When a current flows through a wire, some energy is lost as heat. The higher the current, the more heat is lost. National Grid transmits electricity at a low current in order to reduce these losses; however this requires a high voltage.

2.3.2 Overhead lines tend to be the most economical means to provide power transmission for large quantities of electric power.

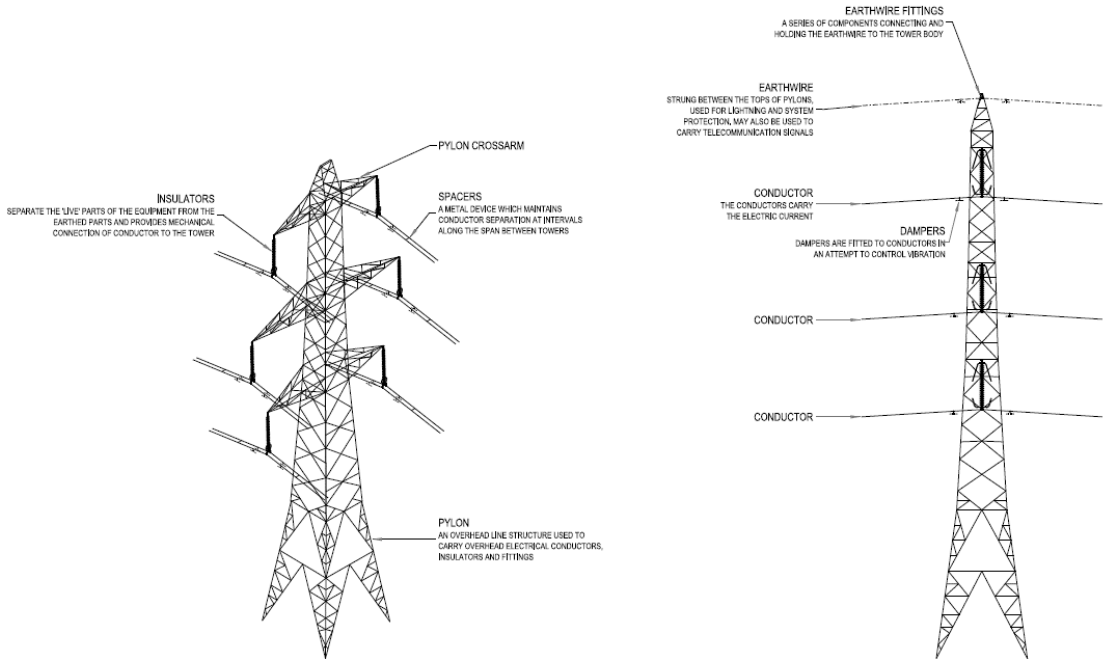
2.3.3 The new and existing overhead lines which form part of the Project will carry electrical conductors supported by lattice pylons. Conductors are layered wires made of aluminium with a steel or composite core for strength through which electricity can easily flow. The conductors are connected to the pylon by an insulator set (insulators are components made from a material with a high resistance to the flow of electric current such as glass or porcelain), steel insulator fittings and a conductor clamp (the conductor clamp forms the connection between the conductor and one end of the insulator set).

2.3.4 There are three types of pylon:

- suspension pylons: these are used when the route travels in a straight line;
- tension pylons: these are used to turn corners or maintain tension on the conductors when there are long straight runs; and
- terminal pylons: these terminate the overhead line when the line is connected into substations or CSECs.

2.3.5 The key components found on pylons are shown in **Figure 2.1, Figure 2.2 and Figure 2.3** below**.** The **Design Drawings** (**Volume 2, Document 2.15**) also shows examples of pylons with single conductors and twin conductors.

## Figure 2.1 - Example of a 400kV double circuit lattice pylon




ISOMETRIC VIEW ON PYLON
L8(c) D STD

SIDE VIEW ON PYLON
L8(c) D STD

## Figure 2.2 - Example of single conductors (left image) and twin conductors (right image)

2.3.6 In the right image above, twin conductors as opposed to single conductors are needed where more power needs to be transmitted across the network.

2.3.7 The height of pylons required on a transmission line varies according to environmental conditions such as topography, or technical requirements. For example, they may need to be taller when crossing roads, railways or navigable rivers or to maintain appropriate clearances.

2.3.8 The clearance required depends on factors such as the operating voltage of the line, topography and the obstacle being crossed, and the pylons need to be sufficiently tall to ensure that statutory clearances from the bottom conductors are achieved. Minimum statutory clearances must be maintained between conductors and the ground, trees, buildings and any other structures such as street lighting columns.

## 2.4 Description of the substation technology to be used for Yorkshire GREEN

### Overton Substation

2.4.1 As the Project involves connecting two lines that are at different voltages, a new substation at Overton is required. (The two overhead lines are the 400kV Norton to Osbaldwick (2TW/YR) overhead line and the existing 275kV Poppleton to Monk Fryston (XCP) overhead line). Further details about the lines are set out in **Chapter 3: Description of the Development** (**Volume 5, Document 5.2.3**).

2.4.2 The Overton Substation would have a footprint of approximately 60,000m2 and contain four Super Grid Transformers (SGTs) which would convert the voltage levels. The SGTs would be installed within concrete bunds. The substation would also contain two full line tension, and four gantries (two per overhead line) where each overhead line connects into the substation, as well as a control building. It is assumed that both the substation equipment and gantries would be up to a maximum height of 15m above the finished ground level. Underground cabling within the substation would connect one Overton - Poppleton circuit from the overhead lines into the substation. The substation would be enclosed by an electrified palisade fence in line with National Grid standards. A small transformer compound, which would be operated by Northern Power Grid, would be located outside the perimeter of the substation and connected to the substation by a short section of underground cable. A permanent access road surfaced with impermeable pavement would provide access from Overton Road. This would be designed to accommodate the Abnormal Indivisible Loads (AIL) required to install the SGTs at the substation. Drainage measures would be incorporated into the design of the substation (**Flood Risk Assessment, Appendix 9D, Volume 5, Document 5.3.9D**) with an outfall to the Hurns Gutter. The substation would be unmanned on a permanent basis with regular maintenance visits to the Substation.

2.4.3 **Figure 2.3 and Figure 2.4** below show an image and typical layout for a substation and **Figure 3.2, Volume 5, Document 5.4.3,** shows the location of the substation.

## Figure 2.3 – Typical substation (existing Monk Fryston Substation)

**Figure 2.4 – Typical substation layout (existing substation at Monk Fryston)**

## Monk Fryston Substation

2.4.4 A new 400kV Substation would be installed adjacent to (and connecting into) the existing Monk Fryston 400/275kV Substation to enable the uprated XC overhead line to connect into the Electricity Transmission System (see **Figure 3.6, Volume 5, Document 5.4.3**). The new substation is required as the existing substation equipment is only rated to take a certain amount of power, and the increased rating of the XC overhead line would be above the capability of the equipment at the existing substation so cannot be used. The proposed substation would have a footprint of approximately 90,000m2 and is likely to be similar in height to the buildings and infrastructure at the existing substation (assumed for the purposes of assessment to be 15m). The new substation would contain four super grid transformers (SGTs) within concrete bunds to step up the 275kV voltage of the XC overhead line to 400kV to connect into the new substation. Underground cables (approximately 600m in length) would be installed within the substation to connect one circuit of the XC overhead line to the substation. The new substation would also contain switchgear and equipment, a control building housing equipment and car parking. The substation would be enclosed by an electrified palisade fence in line with National Grid standards. A small transformer compound, which would be operated by Northern Power Grid, would be located inside the perimeter

of the substation and connected to the substation by a short section of underground cable. Drainage measures will be incorporated into the design of the substation (**Appendix 9D: Flood Risk Assessment, Volume 5, Document 5.3.9D**). It is assumed the substation would be unmanned on a permanent basis with regular maintenance visits to the substation. **Figure 3.6, Sheet 1 of 1, Volume 5, Document 5.4.3** shows the location of the substation.

## 2.5 Description of the CSEC technology to be used for Yorkshire GREEN

2.5.1 CSECs are required at the interface between overhead lines and underground cables. Each CSEC would have a permanent access track with a security fence around it and gate, and be connected to the overhead line via a gantry (Shipton South CSEC and Tadcaster Tee West) or an anchor block solution (Shipton North CSEC and Tadcaster Tee East). An anchor block comprises a concrete block on the ground. (An anchor block is needed at Tadcaster Tee East due to the lack of space between Tadcaster Tee East and the embankment to the A64). The downleads from the CSEC come down off the structure and connect to this block. The blocks are smaller than gantries and can be located much closer to the pylon and are therefore used at locations, such as at Shipton North CSEC, where the space is compromised. An image of a typical CSEC and connection onto a gantry is shown in **Figure 2.5** below and the location of the CSECs at Shipton as well as the 400kV YN overhead line is shown on **Figure 3.2, Volume 5, Document 5.4.3.** The location of the CSECs at Tadcaster is shown on **Figure 3.4, Volume 5, Document 5.4.3.**

**Figure 2.5 – Example of Cable Sealing End Compound with Gantry**

2.5.2 The CSECs contain equipment that is monitored remotely. Routine visits would be required to visually inspect the condition of non-mechanical equipment, structures and buildings. Mechanical (manual operated) earth switches would require inspection and servicing as part of these visits.

# 3 Legislation, Policy and Guidance Context

## 3.1 Introduction

3.1.1 The Planning Statement (**Volume 7, Document 7.1**) submitted with the Application sets out a comprehensive review of relevant national and local planning policy.

3.1.2 The text below provides a summary of the relevant design legislation and policy that the Project has been developed in accordance with.

## 3.2 The legislative and policy context

### NPS EN-1 overarching national policy statement for energy (EN-1)[10]

3.2.1 Of particular relevance to this DAS is Part 4.5 of EN-1 Criteria for "good design" for energy infrastructure. Paragraph 4.5.1 of EN-1 explains that whilst visual appearance is sometimes considered to be the most important factor in good design, "*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. Applying "good design" to energy projects should produce sustainable infrastructure sensitive to place, efficient in the use of natural resources and energy used in their construction and operation, matched by an appearance that demonstrates good aesthetic as far as possible".* However, the guidance acknowledges 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"*.

3.2.2 Paragraph 4.5.3 goes on to explain that "*in light of the above, and given the importance which the Act places on good design and sustainability, the IPC (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"*. The Secretary of State should satisfy itself that "*the applicant has taken into account both functionality (including fitness for purpose and sustainability) and aesthetics (including its contribution to the quality of the area in which it would be located) as far as possible. 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, landform 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"*.

3.2.3 EN-1 therefore recognises that in discussing 'good design' the concept is more than simply a consideration of visual appearance. Through the adoption of good design principles, National Grid has sought to develop its proposals in an iterative manner,

[10] Department of Energy and Climate Change (2011). Overarching National Policy Statement for Energy (EN-1). (online) Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf (Accessed October 2022).

considering local constraints or concerns (as set out in **Chapter 4** of this DAS in terms of physical context, and **Chapter 6** of this DAS in terms of feedback received), where possible, and amending the Project where feasible, taking into account alternatives, in order to avoid and minimise adverse impacts associated with the Project. The concept of good design has therefore not only informed the selection of technologies, route of the overhead line and the location of Overton Substation, the Monk Fryston Substation, and the CSECs but also those embedded mitigation measures as set out in the **Embedded Environmental Measures Schedule** (**ES Appendix 3A, Volume 5, Document 5.3.3A**) which will avoid, reduce or compensate for adverse effects both during the construction and operation of this Project which is of national significance.

### Overarching national policy statement for electricity networks infrastructure (EN-5)[11]

3.2.4 Paragraphs 2.5.1 and 2.5.2 of EN-5 address the concept of good design, stating that proposals for electricity networks infrastructure should demonstrate good design in their approach to mitigating the potential adverse impacts which can be associated with overhead lines, particularly with regard to:

- biodiversity and geological conservation;
- landscape and visual;
- noise and vibration; and
- electric and magnetic fields.

3.2.5 EN-5 does not seek to direct applicants to particular sites or routes for electricity networks infrastructure (paragraph 2.2.1). It notes that the general location of electricity network projects is often determined by the location, or anticipated location, of a particular generating station in relation to the existing network. In other cases the requirement for a connection may be the result of the need for more strategic reinforcement of the network. NPS EN-5 accepts that the most direct route for a new connection may not always be the most appropriate given engineering and environmental considerations (paragraph 2.2.2).

3.2.6 Part 2 of EN-5 sets out the basis for assessing proposals. It advises for a variety of topic areas (including many of those normally covered in an Environmental Impact Assessment, and which are covered in the accompanying ES) what the applicant's own assessments should address and what principles should be adopted in decision making. It also advises on the weight to be given to certain issues and on the treatment of mitigation measures, particularly how these may be enforced through requirements or obligations.

3.2.7 EN-5 adds further detail to the general advice set out in EN-1 on landscape and visual impact considerations. Paragraph 2.8.2 states:

*"Government does not believe that development of overhead lines is generally incompatible in principle with developers' statutory duty under section 9 of the Electricity Act to have regard to amenity and to mitigate impacts. In practice new above ground electricity lines, whether supported by lattice steel towers/pylons or wooden poles, can give rise to adverse landscape and visual impacts, dependent upon their scale, siting,*

[11] Department of Energy and Climate Change (2011). National Policy Statement for Electricity Networks Infrastructure (EN-5). (online) Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47858/1942-national-policy-statement-electricity-networks.pdf (Accessed October 2022).

*degree of screening and the nature of the landscape and local environment through which they are routed. For the most part these impacts can be mitigated, however at particularly sensitive locations the potential adverse landscape and visual impacts of an overhead line proposal may make it unacceptable in planning terms, taking account of the specific local environment and context. New substations, sealing end compounds and other above ground installations that form connection, switching and voltage transformation points on the electricity networks can also give rise to landscape and visual impacts."*

3.2.8 Paragraph 2.8.5 of EN-5 supports the continued application of the Holford Rules, which are described below in paragraphs 3.2.20 and 5.3.1 to guide the selection of routes for overhead lines. It states that the Examining Authority should expect the applicant to have followed these Rules where possible in its overhead line proposals and that the Examining Authority should take them into account in any consideration of alternatives and in considering the need for any additional mitigation measures. In addition to following the principles set out in the Holford Rules, Paragraph 2.8.10 of EN-5 explains that one of the main opportunities for mitigating potential landscape and visual impacts is the consideration of network reinforcement rather than installing an entirely new line.

3.2.9 In discussing the undergrounding of overhead lines in Paragraph 2.8.8, EN-5 states that:

*"where there are serious concerns about the potential landscape and visual effects of a proposed overhead line (the Secretary of State) will have to balance these against other relevant factors, including the need for the proposed infrastructure, the availability and cost of alternative sites and routes and methods of installation (including undergrounding)."*

## Draft National Policy Statements

3.2.10 As part of the Government's review of the suite of energy NPSs, the Department for Business, Energy & Industrial Strategy (BEIS) published draft NPSs, including EN-1[12] and EN-5[13], that were the subject of consultation between September and November 2021. While this review is undertaken, the current suite of energy NPSs remain relevant Government policy and, therefore, the extant 2011 NPSs listed above continue to have effect for the purposes of the Act[1].

3.2.11 The draft NPS EN-1 proposes to introduce policy (including assessment principles and policy concerning the consideration of generic impacts) that is substantively different to that contained in the designated NPS EN-1, this is referenced in the relevant sections of the planning policy assessment set out in **Chapter 8** of the **Planning Statement** (**Volume 7, Document 7.1**).

3.2.12 Draft NPS EN-5 highlights the importance of electricity networks to supporting the delivery of the new electricity generation infrastructure the UK needs to transition to net zero. Where the Draft NPS introduces proposed policy that is substantively different to

[12] Department for Business, Energy & Industrial Strategy (2021). Draft Overarching National Policy Statement for Energy (EN-1). (online) Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015233/en-1-draft-for-consultation.pdf (Accessed October 2022).

[13] Department for Business, Energy & Industrial Strategy (2021). Draft National Policy Statement for Electricity Networks Infrastructure (EN-5). (online) Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015238/en-5-draft-for-consultation.pdf (Accessed October 2022).

that contained in the extant, designated NPS EN-5, this is referenced in the relevant sections of the planning policy assessment set out in **Chapter 8** of the **Planning Statement** (**Volume 7, Document 7.1**).

3.2.13 In terms of design, the draft NPS EN-5 is substantively the same as the existing NPS EN-5, albeit the Horlock Rules (detailed below) are now specifically referred to. At paragraph 2.11.11 of the draft NPS EN-5 it states that the Horlock Rules should be embodied in applicants' proposals for the infrastructure associated with overhead lines.

3.2.14 Like the existing NPS, the draft NPS makes clear (at paragraph 2.7.2) that when considering proposals for electricity networks *"the functional design constraints of safety and security may limit an applicant's ability to influence the aesthetic appearance of that infrastructure".*

## National Planning Policy Framework

3.2.15 Paragraph 152 of the National Planning Policy Framework (NPPF[14]) states:

*"The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure".*

## Local plan policies

3.2.16 Although an application for an Order granting Development Consent is not subject to Section 38(6) of the Planning and Compulsory Purchase Act 2004[15], local development plans are a material planning consideration.

3.2.17 The Planning Statement has considered the Project against the following key policy documents:

- Hambleton Local Plan[16] (Adopted February 2022) HLP 2009;
- Harrogate District Local Plan[17] (Adopted December 2020) HDLP 2020;
- Leeds Core Strategy[18] (as amended by the Core Strategy Selective Review 2019) LCS 2019;

[14] Ministry of Housing, Communities & Local Government (2021). National Planning Policy Framework (online). Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2 (Accessed October 2022).
[15] UK Government (2004). The Planning and Compulsory Purchase Act 2004 c.5 (online). Available at: https://www.legislation.gov.uk/ukpga/2004/5/contents (Accessed October 2022).
[16] Hambleton District Council (2022). Local Plan (online) Available at: https://www.hambleton.gov.uk/local-plan-1 (Accessed October 2022).
[17] Harrogate Borough Council (2020). Harrogate District Local Plan 2014-2035 (online). Available at: https://www.harrogate.gov.uk/planning-policy-guidance/harrogate-district-local-plan-2014-2035 (Accessed October 2022).
[18] Leeds City Council (2019). Core Strategy (as amended by the Core Strategy Selective Review 2019) (online). Available at: https://www.leeds.gov.uk/planning/planning-policy/adopted-local-plan/core-strategy-

- Selby District Local Plan[19] (Saved Policies) (2005) SDLP 2005;
- Selby District Core Strategy Local Plan[20] (2013) SDCSLP 2013;
- City of York Draft Local Plan Incorporating the 4th Set of Changes[21] (April 2005) CYDLP 2005;
- North Yorkshire Minerals and Waste Joint Plan (NYMWJP)[22] February 2022 NYMWJP 2022; and
- Upper Poppleton and Nether Poppleton Neighbourhood Plan (2016-2036[23]) (UPNPNP 2017).

3.2.18 The following emerging documents were also examined.

- Selby District New Local Plan (Preferred Options[24]) SDNLP Preferred Options 2021; and
- City of York Local Plan[25] (Publication Draft February 2018 (Regulation 19 Consultation) CYLPPD 2018.

3.2.19 Within the above development plans there are a number of planning policies which highlight the importance of high quality and sustainable design which acknowledges local character and enhances the local environment. The development plan policies do not provide criteria for determining the acceptability of NSIPs, and in their detail they are not always directly applicable to linear infrastructure projects. Notwithstanding this the overarching principles of responding to place, minimising adverse impacts and enhancing the local environment have been key objectives for the Project.

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introduction#:~:text=Core%20Strategy%20for%20Leeds&text=The%20Core%20Strategy%20is%20the,a%20housing%20requirement%20to%202033. (Accessed October 2022).

[19] Selby District Council (2005). Selby District Local Plan. (Online) Available at: https://www.selby.gov.uk/selby-district-local-plan-sdlp-2005 (Accessed October 2022)

[20] Selby District Council (2013). Selby District Core Strategy Local Plan. (Online) Available at: https://www.selby.gov.uk/sites/default/files/Documents/CS_Adoption_Ver_OCT_2013_REDUCED.pdf (Accessed October 2022).

[21] City of York Council (2005). City of York Local Plan Publication Draft. (Online) Available at: https://www.york.gov.uk/downloads/download/820/the-development-control-local-plan-2005-and-proposals-maps (Accessed October 2022).

[22] North Yorkshire County Council, City of York Council, North York Moors National Park Authority (2015 to 2033). Minerals and Waste Joint Plan – Publication Draft. (Online) Available at: www.northyorks.gov.uk/sites/default/files/fileroot/Planning%20and%20development/Minerals%20and%20waste%20planning/Examination%20Library/Adoption/LPA128%20-%20%20MWJP%20Policy%20adopted%20document%20-%20Final%2007.22.pdf (Accessed October 2022).

[23] Upper Poppleton Parish Council and Nether Poppleton Parish Council (2017). Upper Poppleton and Nether Poppleton Neighbourhood Plan (online). Available at: https://www.york.gov.uk/planning-policy/upper-nether-poppleton-neighbourhood-plan (Accessed October 2022).

[24] Selby District Council (2021). Selby New Local Plan Preferred Option. (Online) Available at: https://www.selby.gov.uk/localplan (Accessed October 2022)

[25] City of York Council (2018). City of York Local Plan Publication Draft. (Online) Available at: https://www.york.gov.uk/downloads/download/581/local-plan-publication-draft-2018-consultation (Accessed October 2022).

### Holford rules

3.2.20 Broad principles for overhead transmission line routeing were formulated by the late Lord Holford and published in 1959 by the Royal Society of Arts. These rules, known as the 'Holford Rules', were reviewed by National Grid in 1992 and have become accepted within the electricity transmission industry as the basis for overhead transmission line routeing.

3.2.21 In overview, the Holford Rules seek to minimise any adverse impacts associated with new overhead lines through the adoption of a series of 'common sense' rules. The seven rules and supplementary notes which are identified in Section 5.3 of the DAS seek to inform the routeing of overhead lines by guiding them away from areas which are considered to be of the highest amenity value and maintain as direct and straight an alignment as possible (in order to minimise the use of larger angle towers).

3.2.22 The Holford Rules were adopted by National Grid in Section B (North West of York Area) when considering the options for the new 400kV overhead line:

- a straighter and more direct connection (Holford Rule 3) that minimises landscape and visual effects on Woodstock Lodge wedding venue (a visual and socio-economic receptor) has been taken forward.
- the connection taken forward also maximised distance and achieved preferable positioning of angle towers to minimise effects on residential properties (Supplementary Note 3 of the Holford Rules) and other receptors.
- Holford Rules 1, 2, 4, 5 to 7 and the Supplementary Notes 1 and 2, were not considered to help differentiate between the 400kV alignment options because neither affected areas of amenity value, specified landscape types or specified land uses.

3.2.23 The Holford Rules did not apply to other sections of the Project, as the works proposed relate to site specific infrastructure (rather than linear development) or works to existing overhead lines.

### Horlock rules

3.2.24 The Horlock Rules set out National Grid's approach to substation siting and design in the context of the company's duties under Schedule 9 of the Electricity Act[9]. The guidelines are set out in **Chapter 5** of this DAS. In summary, like the Holford Rules they facilitate consideration of environmental and amenity considerations within the design and siting of new substation infrastructure. Paragraph 2.11.11 of the draft NPS EN-5 states that the Horlock Rules should be embodied in applicants' proposals for the infrastructure associated with overhead lines.

3.2.25 In line with paragraph 2.11.11 of draft NPS EN-5, the Horlock Rules were applied in determining the preferred location for the new substations at Overton and Monk Fryston and the CSECs at Shipton and Tadcaster (see further detail in **Chapter 6** of this DAS).

## 3.3 Summary

3.3.1 This DAS is provided to demonstrate how National Grid has taken into account the criteria for good design contained within EN-1 and EN-5. The DAS describes the design of the Project and the various components of associated development in a proportionate way. The document also explains the way in which the design of the Project has evolved.

# 4 Physical Context

## 4.1 Section A: Osbaldwick Substation

4.1.1 Osbaldwick 400kV Substation is located 4km east of the centre of York, 50m north of the A1079 and 600m west of the A64/A1079 junction. Surrounding land uses comprise wooded areas, some of which is priority habitat; agricultural fields to the north and east; a business park to the north-west and the residential area of Osbaldwick 200m to the west. A short section (two pylons) of the southern end of the existing 400kV Norton to Osbaldwick (YR) overhead line falls within the Order Limits where this overhead line connects into Osbaldwick Substation. Osbaldwick Substation is located within the administrative area of the City of York Council.

## 4.2 Section B: North West of York Area

4.2.1 Section B largely comprises agricultural land and is between 2km and 10km to the north-west of York. The settlements of Shipton-by-Beningbrough, Skelton and Overton are 800m north-west, 400m south-east and 100m south respectively from the North West of York Area (see Section 3.3).

4.2.2 The East Coast Mainline (ECML) railway (travelling from London to Edinburgh) runs through the North West of York Area in a south-east to north-west direction. There are no trunk roads but there are two A roads connecting to the City of York (A19 and A59). The Way of the Roses National Cycle Network (NCN Route 65) crosses through the North West of York Area linking the City of York with Beningbrough Hall (a Grade I listed building owned by the National Trust) via the villages of Overton and Shipton by Beningbrough.

4.2.3 The River Ouse passes through Section B in a north-west to south-east direction, with Flood Zone 2 and Flood Zone 3 land either side. Other notable watercourses in Section B include Moor Gutter, Hurns Gutter and Hurns Drain. There is one area of ancient woodland, Overton Wood, adjacent to the Order Limits, located north of the River Ouse.

4.2.4 Existing electricity infrastructure in Section B includes the 400kV Norton to Osbaldwick (2TW/YR) overhead line route which is located in the north of the North West of York Area, 1.6km north-west of Haxby at its closest point. It connects Norton 400kV Substation, approximately 64km north of the Project, with Osbaldwick 400kV Substation to the east of York. A 2.4km section (eight pylons) of this existing overhead line falls within Section B and this section of overhead line crosses the B1363 Sutton Road and Bull Lane. Land uses beneath the overhead line and in the surrounding area largely comprise agricultural land and individual scattered residential and farm buildings.

4.2.5 A section of the existing 275kV Poppleton to Monk Fryston XCP overhead line route also falls within Section B between Moor Monkton and north-east of Nether Poppleton, adjacent to and north of the River Ouse. This overhead line is a total of 38km in length and connects Poppleton 275kV Substation on the north-western outskirts of York with the existing Monk Fryston 275kV/400kV Substation, approximately 26km to the south-west of York. Within the Section B the overhead line runs broadly east-west crossing the ECML and the River Ouse.

4.2.6 Section B lies within the administrative areas of Hambleton District Council, City of York Council, Harrogate District Council and North Yorkshire County Council.

## 4.3 Section C: Moor Monkton to Tadcaster - existing 275kV Poppleton to Monk Fryston (XC) overhead line north of Tadcaster (Section D)

4.3.1 Within this section the existing 275kV Poppleton to Monk Fryston XC overhead line is aligned north-south, crossing the A59, the York – Harrogate Railway Line, the Battle of Marston Moor Registered Battlefield, B1224 Wetherby Road, the River Wharfe and the A659.

4.3.2 This section of the Project lies within the administrative areas of Harrogate District Council, Selby District Council and North Yorkshire County Council.

## 4.4 Section D: Tadcaster Area

4.4.1 Section D is approximately 3km south-west of Tadcaster comprising agricultural land to the north-east of the A64/A659 junction. There are a limited number of scattered residential properties in the locality with Toulston Polo Ground approximately 800m to the north.

4.4.2 Existing infrastructure in Section D includes a section of the 275kV Poppleton to Monk Fryston (XC) overhead line. This connects the 275kV Tadcaster Tee to Knaresborough (XD/) overhead line route approximately 2.5km south-west of Tadcaster, a 2.7km section of which is located within the Tadcaster Area. Within Section B the 275kV Tadcaster Tee to Knaresborough (XD) overhead line crosses the A659 and Warren Lane and over sails agricultural land with individual scattered residential and farm buildings in the surrounding area.

4.4.3 Section D lies within the administrative areas of Selby District Council, Leeds City Council and North Yorkshire County Council.

## 4.5 Section E: Tadcaster to Monk Fryston - existing 275kV Poppleton to Monk Fryston (XC) overhead line south of Tadcaster (Section D)

4.5.1 South of Tadcaster the existing Poppleton to Monk Fryston 275kV XC overhead line runs adjacent to the Battle of Towton Registered Battlefield and Huddleston Wood Ancient Woodland before crossing railway lines connecting York and Leeds and Selby and Leeds. The southern end of this overhead line is aligned parallel to the east of the A1(M).

4.5.2 This section of the Project lies within the administrative areas of Selby District Council and North Yorkshire County Council.

## 4.6 Section F: Monk Fryston Substation Area

4.6.1 Section F is located approximately 2km south-west of the village of Monk Fryston, south of the A63 and west of the A1(M). The land within the Monk Fryston Substation Area is predominantly agricultural land and also includes the existing Monk Fryston 275kV /

400kV Substation as well as Rawfield Lane which runs north-south through the area connecting with the A63 to the north and the A1246 to the south. There are two residential properties adjacent; Pollums House Farm (and associated farm buildings) located approximately 500m west and the Grade II listed Monk Fryston Lodge (and associated buildings) approximately 200m to the east of the existing substation.

4.6.2 Existing infrastructure in Section F comprises the 275kV Poppleton to Monk Fryston (XC) overhead line route which connects into the existing Monk Fryston Substation from the west and the 400kV Monk Fryston to Eggborough (4YS) overhead line route which connects into the existing substation from the east. This overhead line connects the existing Monk Fryston Substation with Eggborough Substation approximately 10km south-east of the Project. Only a short section (750m) of this overhead line falls within Section F to the east of the existing substation. This section over sails fields and an area of priority habitat woodland with Monk Fryston Lodge, a Grade II Listed Building, located approximately 350m to the north.

4.6.3 Section F lies within the administrative areas of Selby District Council and North Yorkshire County Council.

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# 5 National Grid's Design Principles

## 5.1 Introduction to National Grid's overarching design principles

5.1.1 National Grid has sought to develop a well designed Project which responds positively to environmental constraints and comments from key stakeholders and the public (further details on the consideration of alternatives put forward in feedback is set out in **Chapter 6** of this DAS below and in the **Consultation Report**, **Volume 6, Document 6.1**). National Grid's objective is to ensure that the Project, which is a development of National Significance, is designed to mitigate any potential adverse impacts where possible which can be associated with overhead lines.

5.1.2 In April 2022, National Grid published its Approach to Consenting (**Volume 5, Document 5.2.2A**). This states that *"Whether the proposed development is predominantly overhead, underground or sub-sea, further detailed survey and assessment work may be carried out to help refine the route (or site) which best balances our duties, obligations and the views of stakeholders. In doing this we seek to avoid as far as practical impacts on people, communities, environmentally sensitive areas and any other important receptors".*

5.1.3 The design evolution for the Project has been an iterative process. National Grid has looked at ways to achieve good design through the careful consideration of route corridors and application of design principles which have been subject to consultation. National Grid has also investigated alternatives from suggested design changes made during consultation, which are reported in the Consultation Report, **Volume 6, Document 6.1**. **Chapter 6** of this DAS describes the design approach adopted by National Grid from Project inception through to the draft DCO. The DAS explains why particular options have been brought forward and demonstrates how the design development process has responded positively to consultation and, where practical and beneficial, incorporated consultation responses into the designs.

5.1.4 Before addressing those matters, it is necessary to outline those design principles which National Grid has adopted to inform the design.

## 5.2 Holford Rules

5.2.1 National Grid employs the Holford Rules to inform the design and routeing of overhead lines. The rules were reviewed by National Grid in 1992 and have become accepted within the electricity transmission industry as the basis for overhead transmission line routeing. Paragraph 2.8.5 of EN-5 states that the Holford Rules should be used by developers when designing their proposals.

5.2.2 The Holford Rules state that developers should:

- **Rule 1** - avoid altogether, if possible, the major areas of highest amenity value, by so planning the general route of the line in the first place, even if total mileage is somewhat increased in consequence;
- **Rule 2** - avoid smaller areas of high amenity value or scientific interest by deviation, provided this can be done without using too many angle towers i.e. the bigger structures which are used when lines change direction;

- **Rule 3** - other things being equal, choose the most direct line, with no sharp changes of direction and thus with fewer angle towers;
- **Rule 4** - choose tree and hill backgrounds in preference to sky backgrounds wherever possible; and when a 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;
- **Rule 5** - prefer moderately open valleys with woods where the apparent height of towers will be reduced, and views of the line will be broken by trees;
- **Rule 6** – in country which is flat and sparsely planted, keep the high voltage lines as far as possible independent of smaller lines, converging routes, distribution poles and other masts, wires and cables, so as to avoid a concentration of lines or 'wirescape', and
- **Rule 7** - approach urban areas 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 undergrounding.

5.2.3 Supplementary notes have been added to the Holford Rules which state:

- residential areas – avoid routeing close to residential areas as far as possible on grounds of general amenity;
- designations of county, district and local value – where possible choose routes which minimise the effect on special landscape areas, areas of great landscape value and other similar designations of county, district or local importance;
- alternative tower design – in additional to adopting appropriate routeing, evaluate where appropriate the use of alternative tower designs are available where these would be advantageous visually and where the extra cost can be justified.

5.2.4 The Holford Rules were adopted by National Grid in Section B (North West of York Area) when considering the options for the new 400kV overhead line:

- a straighter and more direct connection (Holford Rule 3) that minimises landscape and visual effects on Woodstock Lodge wedding venue (a visual and socio-economic receptor) has been taken forward.
- the connection taken forward also maximised distance and achieved preferable positioning of angle towers to minimise effects on residential properties (Supplementary Note 3 of the Holford Rules) and other receptors.
- Holford Rules 1, 2, 4, 5 to 7 and the Supplementary Notes 1 and 2, were not considered to help differentiate between the 400kV alignment options because neither affected areas of amenity value, specified landscape types or specified land uses.

5.2.5 The Holford Rules did not apply to other sections of the Project, as the works proposed relate to site specific infrastructure (rather than linear development) or works to existing overhead lines.

## 5.3 Horlock rules

5.3.1 The Horlock Rules were established by National Grid in 2009 and set out the approach to substation siting and design in the context of the company's duties under Schedule 9 of the Electricity Act[9]. The guidelines 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 for new developments against the consequential environmental effects in order to keep adverse effects to a reasonably practicable minimum;
- **Rule 2** - the siting of new National Grid substations, sealing end compounds and line entries should be as far as reasonably practicable seek to avoid altogether internationally and nationally designated areas of the highest amenity, cultural or scientific value by the overall planning of the system connections;
- **Rule 3** - areas of local amenity value, important existing habitats and landscape features including ancient woodland, historic hedgerows, surface and ground water sources and nature conservation areas should be protected as far as reasonably practicable;
- **Rule 4** - the siting of substations, extensions and associated proposals should 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;
- **Rule 5** - the proposals should keep the visual, noise and other environmental effects to a reasonably practicable minimum;
- **Rule 6** - the land use effects of the proposal should be considered when planning the siting of substations or extensions;
- **Rule 7** - in the design of new substations or line entries, early consideration should be given to the options available for terminal towers, equipment, buildings and ancillary development appropriate to individual locations, seeking to keep effects to a reasonably practical minimum;
- **Rule 8** - 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 9** - the design of access road, 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 10** - 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 11** - the inter-relationship between towers 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 towers on prominent ridges should be minimised by siting towers against a background of trees rather than open skylines.

5.3.2 The Horlock Rules were applied in determining the preferred location for the new substation at Overton at Monk Fryston and the CSECs at Tadcaster and Shipton. Further information on the application of the Horlock Rules is provided in **Chapter 6** below.

## 5.4 Undergrounding policy

5.4.1 National Grid considers every case for using underground cables for amenity reasons instead of overhead lines on its merits. The additional cost of high voltage underground transmission coupled with the environmental and operational disadvantages are important reasons for the limited use of underground cables at high voltage 275/400kV. The following guidelines set out the categories of area where consideration may be given to undergrounding.

5.4.2 When planning the routeing for transmission connections in exceptionally constrained areas, consideration may be given to the use of underground cables. Exceptionally constrained areas refer to situations where physical or amenity factors related to landscape, land use and development weigh most heavily against the use of overhead lines and therefore where consideration of underground cables is warranted. In such areas, judgement on the merits of each case will be required to justify the use of underground cables.

5.4.3 The nature of the exceptionally constrained areas varies in urban, rural and estuary crossing areas and the key factors are outlined as a basis for the consideration of the potential use of underground cables.

- exceptionally constrained urban areas: Urban areas where there may be exceptional constraints on the siting of overhead transmission lines comprise those locations where the density of residential, community and associated development and public open space is such that a reasonable direct overhead route is feasible;
- exceptionally constrained rural areas: Of special concern in the siting of overhead transmission lines in the countryside is the protection of important landscape features in nationally or internationally designated areas of amenity value. These designated areas comprise National Parks, World Heritage Sites AONB and Heritage Coasts. Exceptionally constrained rural areas comprise those locations within or immediately alongside those designated areas where the scale of new high voltage transmission towers and conductors would dominate unspoilt landscape and cause serious damage to major open views of spectacular panoramas, crests of prominent ridges and skylines or attractive small scale valleys seen from important locations within or immediately alongside the designated areas;
- exceptionally constrained estuary and major river crossings: these occur where the exceptional difficult and cost of an overhead line would be comparable with or exceed those of an underground cable.

*5.4.4* The existing NPS EN-5 highlights the need for applicants to consider undergrounding where there are *"serious concerns about the potential adverse landscape and visual effects of a proposed overhead line"*. It outlines that these need to be balanced against other relevant factors including need and any alternatives including any extra economic, social, and environmental impacts of undergrounding. The draft NPS EN-1 states that *"The Secretary of State should also have special regard to nationally designated landscapes, where the general presumption in favour of overhead lines should be inverted to favour undergrounding".*

5.4.5 National Grid considers the relative merits of using an underground cable on a case by case basis. The potential use of underground cable in, or close to, exceptionally constrained urban, rural or estuary crossing areas would require the demonstration that this is the most cost effective means of avoiding the need for high voltage overhead lines which would seriously harm the amenity of these areas. Consideration would also have to be given to the potential adverse effects on amenity of undergrounding cables e.g. tree and hedge removal, CSEC, terminal towers and ancillary equipment.

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# 6 Development Proposals – Design Evolution

## 6.1 Introduction

6.1.1 This Chapter of the DAS describes the design evolution of those key components of the Project as described in **Chapter 1** of this report.

6.1.2 The majority of National Grid's infrastructure for the Project is located above ground. The key design objective was to ensure that this infrastructure was integrated successfully into their surroundings using the Holford and Horlock Rules and undergrounding policy as a basis to inform the design and to ensure that the Project is in accordance with the relevant NPS' and National Grid's responsibilities under the Electricity Act[9].

6.1.3 The design of the Project has been an iterative process, influenced by an extensive process of stakeholder engagement. This Chapter seeks to describe the evolution of these principal components and the project-wide factors and feedback which have influenced their design and location.

6.1.4 There is very limited scope to alter the design and physical appearance of the pylon type selected for this Project (steel lattice design) due to their operational restrictions and requirements, and given that the Project creates a connection between two overhead lines that already use steel lattice pylons. This is in accordance paragraph 2.8.2 of NPS EN-5 and National Grid's Approach to Consenting where an assumption is made that overhead steel lattice pylons will be adopted as part of the Project.

6.1.5 As a result, this Chapter of the DAS provides a description of the design development for the core elements of the Project focusing primarily on the:

- Cable Sealing End Compounds (CSECs) at Shipton and Tadcaster; and
- New substations at Overton and Monk Fryston.

6.1.6 Whilst this DAS primarily focuses on the design evolution of the substations and CSECs, linear aspects of the Project i.e. the new 400kV overhead line and 275kV overhead lines, can be found in more detail in **Chapter 2, Volume 5, Document 5.2.2** of the ES.

## 6.2 Project development process

6.2.1 The development of the Project aligned with National Grid's Our Approach to Consenting. The key steps up to the submission of the DCO application include:

- Strategic Proposal;
- Options Identification and Selection;
- Defined Proposal and Statutory Consultation; and
- Assessment and land rights.

6.2.2 These stages are described in turn below.

### Figure 6.1 – National Grid Approach to Consenting


## Strategic Proposal

6.2.3 Once the need for the Project had been established, National Grid then considered the different ways in which the need could be met in order to establish a strategic proposal. The appraisal process is described in the Environmental Statement **Chapter 2: Project Need and Alternatives (Volume 5, Document 5.2.2)** and references the **Strategic Proposal Report 2019 (Volume 7, Document 7.5**), **Strategic Proposal Back Check and Review (Volume 7, Document 7.6)** and **Strategic Proposal Addendum (Volume 7, Document 7.7**).

6.2.4 For electricity infrastructure, National Grid make an initial technology assumption that overhead steel lattice lines will be adopted as part of the Project. This demonstrates National Grid's licence duty to develop an efficient and economical solution. Similarly, the starting position is also to avoid completely, or anticipate undergrounding within, all nationally designated landscapes and their settings. This is again consistent with national policy[11] and, more specifically, with National Grid's Stakeholder, Community and Amenity Policy[26].

6.2.5 The **Strategic Proposal Report** (**Volume 7, Document 7.5**) emphasises that from a technical and cost perspective, an overhead line was considered to be more preferable as it's a proven technology and less expensive than underground cables. There were no national planning policy reasons identified (e.g. nationally designated landscapes or national parks) which would require underground cables to be used instead of an overhead line.

6.2.6 A further key consideration which influenced the selection of the Strategic Proposal was the ability to upgrade or enhance existing National Grid infrastructure. National Grid considers the use of existing infrastructure to be preferable to options which would require wholly new infrastructure. This approach is consistent with National Grid's licence obligations to develop and maintain an efficient, coordinated and economical transmission system and its statutory duty to have regard to amenity under section 38 of the Electricity Act. Therefore, National Grid will propose to build wholly new infrastructure where existing infrastructure cannot be technically or economically upgraded to meet system security standards and regulatory obligations.

## Options Identification and Selection

6.2.7 A Corridor and Preliminary Routeing and Siting Study ('the CPRS Study') (**Volume 7, Document 7.8**) was undertaken to further define the location of the proposed Project infrastructure within a defined Study Area including York North, Tadcaster and Monk Fryston, based on the strategic proposal identified at the strategic options stage (described in **Section 2.5 of Volume 5, Document 5.2.2, Environmental Statement Chapter 2 Project Need and Alternatives**). An Options Appraisal was undertaken for

[26] National Grid (2016). National Grid's commitments when undertaking works in the UK – Our stakeholder, community and amenity policy. National Grid; London.

proposed new infrastructure comprising substations, CSECs and overhead lines. The staged approach to options identification and selection was undertaken in line with National Grid's Approach to Option Appraisal.

6.2.8 The purpose of Options identification and selection is to select, using consultation feedback, a preferred corridor (or site) with a preliminary route swathe which can be developed during the next project phase.

6.2.9 The initial preferred options identified were subject to a non-statutory consultation exercise which took place between 11 March and 15 April 2021. This included two alternative options for the 275kV connection.

6.2.10 The application of this stage of the process to the Project is discussed in further detail in **Volume 5, Document 5.2.2, Environmental Statement Chapter 2 Project Need and Alternatives**.

### Defined proposal and statutory consultation

6.2.11 The 'Defined Proposal and Statutory Consultation' stage involved design development in response to feedback from the non-statutory consultation to support the production of Preliminary Environmental Information and statutory consultation on the Project. As part of consultation feedback analysis, a Design Change Control (DCC) process is used by National Grid to review and process requests for design changes raised by consultees and refine the Project design. A description of the change control process, and a summary of how the non-statutory consultation feedback influenced the proposal is set out in Section 2.7 of **Volume 5, Document 5.2.2, Environmental Statement Chapter 2 Project Need and Alternatives**.

6.2.12 The preliminary design developed during this stage of the Project development process was presented at the statutory consultation between 28 October and 9 December 2021.

### Assessment and Land Rights

6.2.13 The Assessment and Land Rights stage involves iteratively progressing the preliminary design of the Project in response to statutory consultation feedback (including feedback gathered during the additional Persons with an Interest in Land consultation and targeted consultations) and detailed environmental assessment so a detailed Project design can be formed. The required land rights and associated mitigation are also considered at this stage. The DCC process was used to appraise the design changes.

6.2.14 An overview of the statutory consultation feedback and the design changes made as a result of this feedback are described in Section 2.8 of **Volume 5, Document 5.2.2, Environmental Statement Chapter 2 Project Need and Alternatives**.

## 6.3 Physical and social context

6.3.1 The physical context of the route is summarised within Chapter 4 of this DAS. The following sections summarise how this physical context has informed the route selection and shaped the Project taking into account National Grid's Schedule 9 Statement, the Holford Rules, the Horlock Rules and its undergrounding policy.

6.3.2 It is not considered appropriate to repeat the detailed description of the route design process which is set out in **Volume 5, Document 5.2.2, Chapter 2** of the ES.

## 6.4 Ecological context

6.4.1 The potential for impacts on nationally designated sites and the species they support was considered at all stages in the design of the Project. In the Options Identification and Selection Stage, as set out in the (CPRSS) whilst some SSSIs or their Impact Risk Zones fell within the corridors (namely Clifton Ings and Rawcliffe Meadows, and Fairburn and Newton Ings) all corridors avoided Ramsars, SPA and SACs, in accordance with Holford Rule 1. The route taken forward for the Defined Proposal and Statutory Consultation stage avoided all SSSIs in line with Holford Rule 2.

6.4.2 The outline Biodiversity Mitigation Strategy (BMS) (**Volume 5, Document 5.3.3D**) outlines ecological good practice and receptor-specific mitigation during the construction of the Project.

## 6.5 Landscape and visual context

6.5.1 Initial Route Corridors sought to avoid designated landscape areas and residential settlements and properties and to minimise the scale of change in the landscape and on views. In the development of the route, extensive baseline surveys from visual receptors (including properties, footpaths and roads) were undertaken to identify routes and preliminary pylon positions which maximised distance from sensitive receptors and minimised effects as far as possible.

6.5.2 National Grid has sought to avoid negative effects on important landscape features and views from receptors by considering the likely effects of alternative overhead line routes on landscape and views. Wherever possible a route alignment for the proposed overhead line was identified that sought to maximise distance from residential and socio-economic receptors. Careful consideration was also given to the location of pylons to minimise changes in direction of the overhead line and the associated size of the pylon.

6.5.3 Guidance provided by the Holford Rules was used in the identification and appraisal of alignments for the connection between the YR/2TW overhead line and the existing 275kV XCP overhead line, as set out in the Corridor and Preliminary Routeing Siting Study Report (CPRSS). The Holford Rules were also subsequently used in the identification of pylon positions that best minimised effects on the landscape and areas of amenity value.

6.5.4 In accordance with National Grid's guidance on the siting and routeing of infrastructure and the Holford Rules the route corridors chosen for public consultation sought to avoid areas of the highest amenity value and smaller areas of high amenity value as far as possible. This included the Registered Park and Garden at Beningbrough Hall, and Conservation Areas at Osbaldwick, Murton, Skelton, Nether Poppleton and Upper Poppleton.

6.5.5 In order to minimise effects on the landscape, an **Outline Landscape Mitigation Strategy** (**Chapter 3: Description of development, Volume 5, Document 5.2.3**) has been prepared. In summary this proposes the following:

- at Overton Substation – new native woodland planting and scrub on earth mounds along the south side of the A19 between Overton Road and Hurns Gutter, new native woodland planting and scrub on earth mounding to the north-west of the substation and Overton Road designed to allow retention of existing mature/veteran trees to reduce visibility from Overton Road, National Cycle Route 65 and the East

Coast Manline Railway, reinforcement of existing hedgerows and the introduction of species rich meadow planting around the substation boundary. In addition, off-site planting is proposed at Woodstock Lodge wedding venue to minimise effects on this socio-economic receptor.

- at the CSECs at Tadcaster – native scrub planting on the embankments around the western CSEC close to the A64, reinforcement of existing field boundary hedgerows along the edge of the A659 and reinstatement of a historic hedgerows, establishment of a new native hedgerow along the boundary with the A64 highway, introduction of species rich meadow planting in the field adjacent to the A64 highway verge
- at Monk Fryston Substation – new native woodland planting and scrub on earth mounding slopes to the north and south-east of the Monk Fryston Substation, new native woodland planting and scrub on earth mounding slopes to the east of the Monk Fryston Substation to reinforce the establish landscape character pattern of significant woodland cover and to reinforce existing woodland screening around Monk Fryston Lodge to the north-east, re-establishment and reinforcement of historic field boundary hedgerows, introduction of species rich meadow planting between the mounds and proposed Monk Fryston Substation where the small piecemeal parcels of residual farmland could not be efficiently cultivated for arable crops.

## 6.6 Socio-economic context

6.6.1 The key settlements which were identified in the CPRSS include Skelton, Nether Poppleton, Upper Poppleton, Moor Monkton, Nun Monkton Shipton-by-Beningbrough, Rawcliffe, Overton, Fairburn, Hillam and Tadcaster.

6.6.2 In accordance with the Holford Rules, National Grid sought to avoid these settlements and areas of high amenity. The preferred option also facilitates the removal of a section of existing overhead line in proximity to Overton. Socio-economic receptors such as the Forest of Galtres Golf Club, local public rights of way and Woodstock Lodge Wedding Venue were also considered as part of the routeing process with routes preferred which minimised impacts. The Forest of Galtres Gold Club was avoided through the selection of a corridor at the options identification and selection stage that was more distant from this receptor than other potential corridors, see **Figure 4.1 in Corridor and Preliminary Routeing and Siting Study ('the CPRSS') (Volume 7, Document 7.8),** and a subsequent alignment within the selected corridor (Corridor B) which avoided passing over the Gold Club. In terms of Woodstock Lodge Wedding Venue an alignment was selected that maximised distance from this receptor and utilised a route that was straighter and more direct than other options.

## 6.7 Historic environment

6.7.1 National Grid takes into account appropriate guidance and legislation when developing its proposals and seeks to avoid World Heritage Sites, Scheduled Monuments and Registered Parks and Gardens when routeing new transmission infrastructure. National Grid also sought to minimise the effects of new infrastructure on Listed Buildings, Conservation Areas, areas of archaeological interest, historic parks and gardens and historic battlefields. In the identification of the route corridors National Grid sought to avoid and maximise the distance to all historic and cultural heritage assets whilst taking account of other important factors. In the course of this process National Grid has

engaged with relevant stakeholders including local planning authority conservation officers, Historic England and the National Trust to ensure that design proposals minimise the potential for adverse effects.

6.7.2 A Written Scheme of Investigation (WSI) has been produced with relevant consultees to set out a programme of archaeological investigation to mitigate direct effects. The scope of the WSI has been developed from consultation and information gathered through the assessment process.

## 6.8 Climate change and flooding

6.8.1 EN-5 requires National Grid to consider the potential impact of climate change on electricity network infrastructure. Current projections around the impact of climate change in the UK forecast extremes of wet and dry (heavy rain and drought) and more occurrences of high wind. Overhead line design takes account of wind, ice and wind-on-ice loadings.

6.8.2 The potential effects of wind, storms and increasing temperatures as a result of climate change have been considered by National Grid in Chapter 17 of the ES. In terms of Greenhouse Gas emissions and Climate Change Resilience, it concludes that effects of the Project are not significant.

6.8.3 The effects of flooding have been considered in **Chapter 9** of the ES (**Volume 5, Document 5.2.9**). A Flood Risk Assessment (FRA) has also been produced (**Volume 5, Document 5.3.9D**) to support the **draft DCO (Volume 3, Document 3.1**). It confirms that the CSECs and substations have all been preferentially located within Flood Zone 1 in accordance with the sequential test. The FRA also took into account climate change by including climate change allowances, taken from current Environment Agency climate change guidance, to determine the risk of future flood hazard and ensure the Project is resilient to flooding. In summary, this resulted in a recommendation that the Overton Substation would be built on a raised platform with a floor level of 13.71 mAOD[27]

## 6.9 Design evolution of the overhead line connection

6.9.1 The design evolution of the 400kV and 275kV overhead line connection is set out in ES **Chapter 2: Project need and alternatives (Volume 5, Documents 5.2.2**). That chapter explains the identification of the strategic options, followed by the corridor selection, then the proposals taken forward for consultation under Section 42 of the Act[1], culminating in the current defined proposal for the DCO.

6.9.2 The remainder of this chapter will focus on the design evolution of the CSECs and substations.

[27] mAOD means “Meters above ordnance datum”. This gives the actual elevation of the groundwater level referenced to the mean sea level at the UK Ordnance datum at Newlyn, Cornwall. Department for Environment, Food & Rural Affairs (2020). River Flow Data Explained - What Does MAOD Mean? (online). Available at: https://support.environment.data.gov.uk/hc/en-gb/articles/360012877677-River-flow-data-explained-What-does-mAOD-mean- (Accessed October 2022).

## 6.10 Design of the CSECs

6.10.1 As noted in **Section 2.4** in this this DAS, CSECs are required at the interface between overhead lines and underground cables.

6.10.2 In total four CSECs are required:

- Two CSECs on the YR line (known as the Shipton North 400kV and Shipton South 400kV CSECs) – to create a new 400kV electricity transmission connection from the existing 400kV Norton to Osbaldwick (YR) overhead line with the new 400/275kV Overton Substation.
- Two CSECs near Tadcaster Tee (known as Tadcaster Tee East 275kV and Tadcaster Tee West 275kV) – one on the XD overhead line and one on the XC overhead line.

6.10.3 The design of the infrastructure proposed is fixed by virtue of operational and technical requirements. National Grid applied principles of good design, in particular the application of the Holford Rules and Horlock Rules, in seeking to identify appropriate locations for these CSECs. In addition, the position of the CSECs has been informed by environmental constraints.

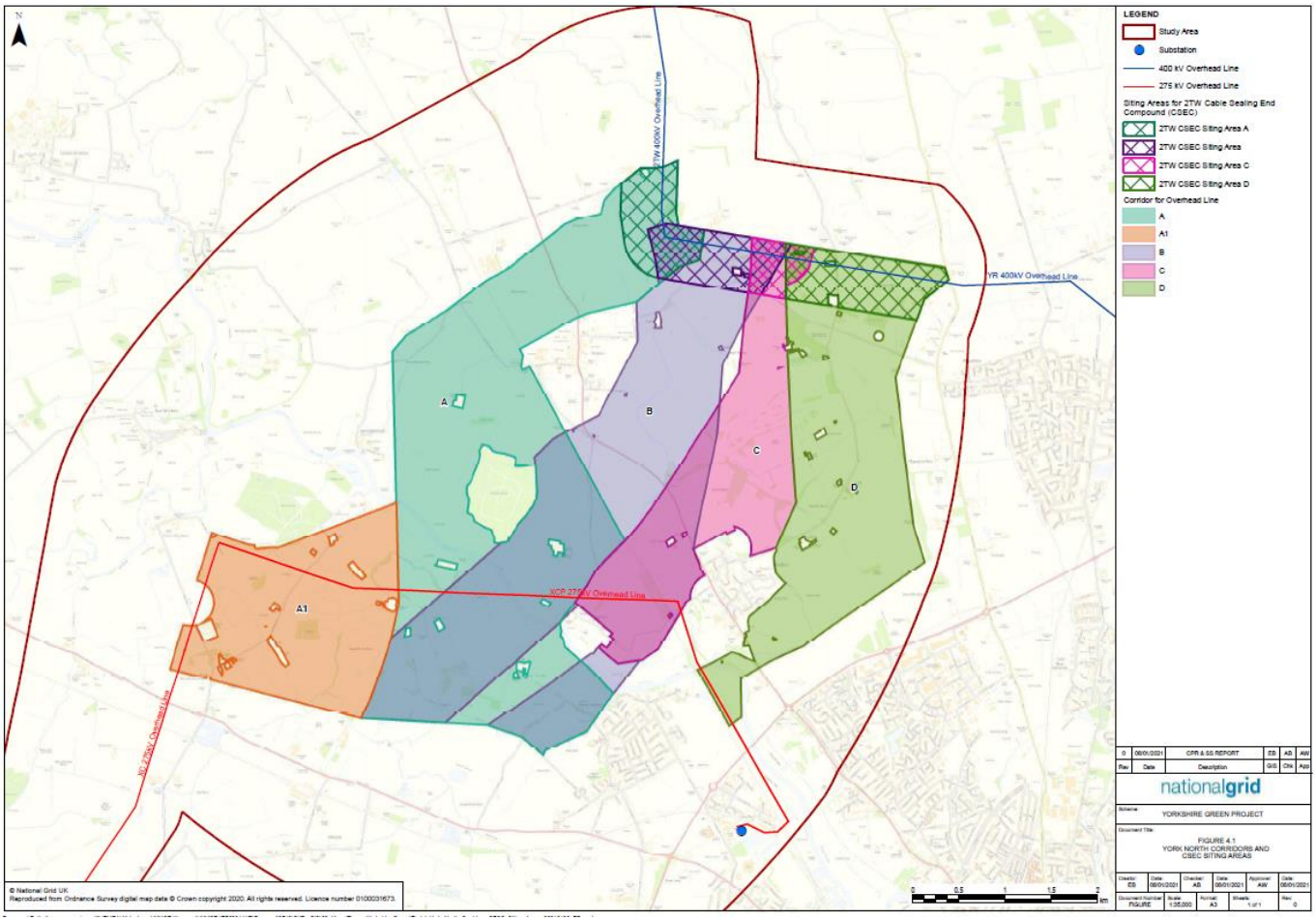
### Shipton North and Shipton South 400kV CSECs

*Options*

6.10.4 Section 2.6 of **Chapter 2** of the ES (**Volume 5, Document 5.2.2**) explains that in Section B four Corridors (A, B, C, and D) were identified for the proposed 400kV and 275kV overhead lines. Corridor section (A1) was also identified to provide options to connect with the far western extent of the existing XCP overhead line. Four Siting Areas were identified for the proposed CSECs at the existing 2TW/YR overhead line (known as 2TWA to 2TWD, which correspond with the four principal Corridors (**Figure 6.2** below)

6.10.5 None of the CSEC siting areas would impact on nationally valued landscape (Horlock Rule 1). Within each of the Siting Areas it was considered possible for infrastructure to be sited to avoid areas of local amenity value (Horlock Rule 2).

## Figure 6.2 – Locations of the CSEC Siting Areas and Corridors for Shipton North and South




### *Preferred Option*

6.10.6 Overall, the combination of the preferred Siting Area and Corridor B was considered to provide the preferred option with respect to both the Horlock and Holford Rules as well as technical feasibility. Corridor B was best aligned with the Holford Rules as it would offer the potential for one of the shortest and most direct routes from the 2TW/YR 400kV overhead line to the proposed substation. The associated siting area of 2TWB aligned with the Horlock Rules as it avoided internationally and nationally designated sites (Horlock Rule 1 and 2) and avoids Grade 1 agricultural land (Horlock Rule 5) as it is sited on Grade 3a agricultural land. This was then taken forward for non-statutory consultation.

### *Post Consultation*

6.10.7 Following non-statutory consultation more detailed design was undertaken, and 400kV overhead line options were developed known as 400-01 and 400-02. CSECs south of Newlands Farm were identified in connection with Option 400-2. Option 400-2 was taken forward as it was considered to minimise landscape and visual effects on the Woodstock Lodge wedding venue and was considered more compliant with the Holford Rules due to it being straighter and more direct (Holford Rule 3), and maximising distance and achieving preferable positioning of angle towers to minimise effects on residential properties (Supplementary Note 3 of the Holford Rules) and other receptors.

Whilst option 400-2 was considered slightly less favourable from an engineering perspective, these differences were not considered to be material or to preclude the development of the option within the required timescales. 400-2 was then consulted on during the statutory consultation stage (see below).

### *Design changes in responses to Statutory consultation feedback*

*Shipton North CSEC*

6.10.8 Stakeholder feedback was received which requested the relocation of the Shipton North CSEC and the temporary overhead line diversion in this area to minimise impacts on the landowner and operation of the farm holding as it was considered that the location of the CSEC could impact upon land owner plans to expand farm operations in this area, some of which was already under construction. Following consideration of this change, the CSEC was moved slightly southwards with the temporary diversion moved from the north to the south of the existing 400kV Norton to Osbaldwick (2TW/YR) overhead line to accommodate this request and avoid effects on the operation of the land holding (in line with Horlock Rule 5). This did not have any adverse engineering or environmental impacts and therefore could be accommodated.

### *Final Design*

6.10.9 Shipton North and South CSECs will have typical footprints of 45m by 85m (3,825m$^2$) and 40m by 45m (1,800m$^2$) respectively. Each CSEC will have a permanent access track with a security fence with a gate around it. An image of a typical CSEC and connection onto a gantry is shown in **Figure 2.5** above and the location of the CSECs as well as the 400kV YN overhead line is shown on **Figure 3.2, Volume 5, Document 5.4.3**, and the **Design Drawings, Volume 2, Document 2.15**.

6.10.10 As existing buildings and vegetation already screen the proposed CSEC sites, and the hedgerow along the farm track to Newlands Farm would be largely reinstated, there would be no requirement for additional mitigation measures to minimise the visual and landscape effects of the proposed CSECs at Shipton.

## Tadcaster CSECs

### *Options*

6.10.11 Currently the existing Poppleton to Monk Fryston (XC/XCP) overhead line connects to the 275kV Knaresborough (XD/PHG) overhead line in the Tadcaster Area. Currently there are electricity circuits between Poppleton and Knaresborough Substations, Monk Fryston and Knaresborough Substations and Monk Fryston and Poppleton Substations. The works, because of the increased rating requirement to the existing XC/XCP overhead line in Section B, mean that the CSECs and underground cable in the Tadcaster Area are needed to create two circuits connecting Overton, Knaresborough and Monk Fryston Substations to help balance power flows on the overhead lines

6.10.12 Ten Siting Areas for two new CSECs (one on the XD overhead line and one on the XC) overhead line at Tadcaster were identified. Three options were located along the alignment of the existing XC overhead line and seven options along the alignment of the existing XD overhead line.

6.10.13 All Siting Areas at Tadcaster avoided *"altogether internationally and nationally designated areas of the highest amenity…"* and were considered to comply with Rule 2

of the Horlock Rules. All Siting Areas were considered to broadly comply with Rule 3 of the Horlock Rules to protect areas of local amenity value. However, three of the most western Siting Areas on the XD overhead line located east and west of Braham Substation were considered least preferable from a biodiversity perspective due to the presence of existing woodland that would be subject to either potential removal or impact.

6.10.14 The two northernmost Siting Areas on the XC overhead line were not considered to fully meet the objective of Rule 4 of the Horlock Rules, which requires the Siting Area to take advantage of the screening provided by the landform and to limit intrusion into the surrounding area. These Siting Areas had open views from Tadcaster and are at a slightly elevated level in relation to the surrounding landscape. All Siting Areas on the XD overhead line were considered acceptable under landscape and visual criteria relating to the Horlock Rules.

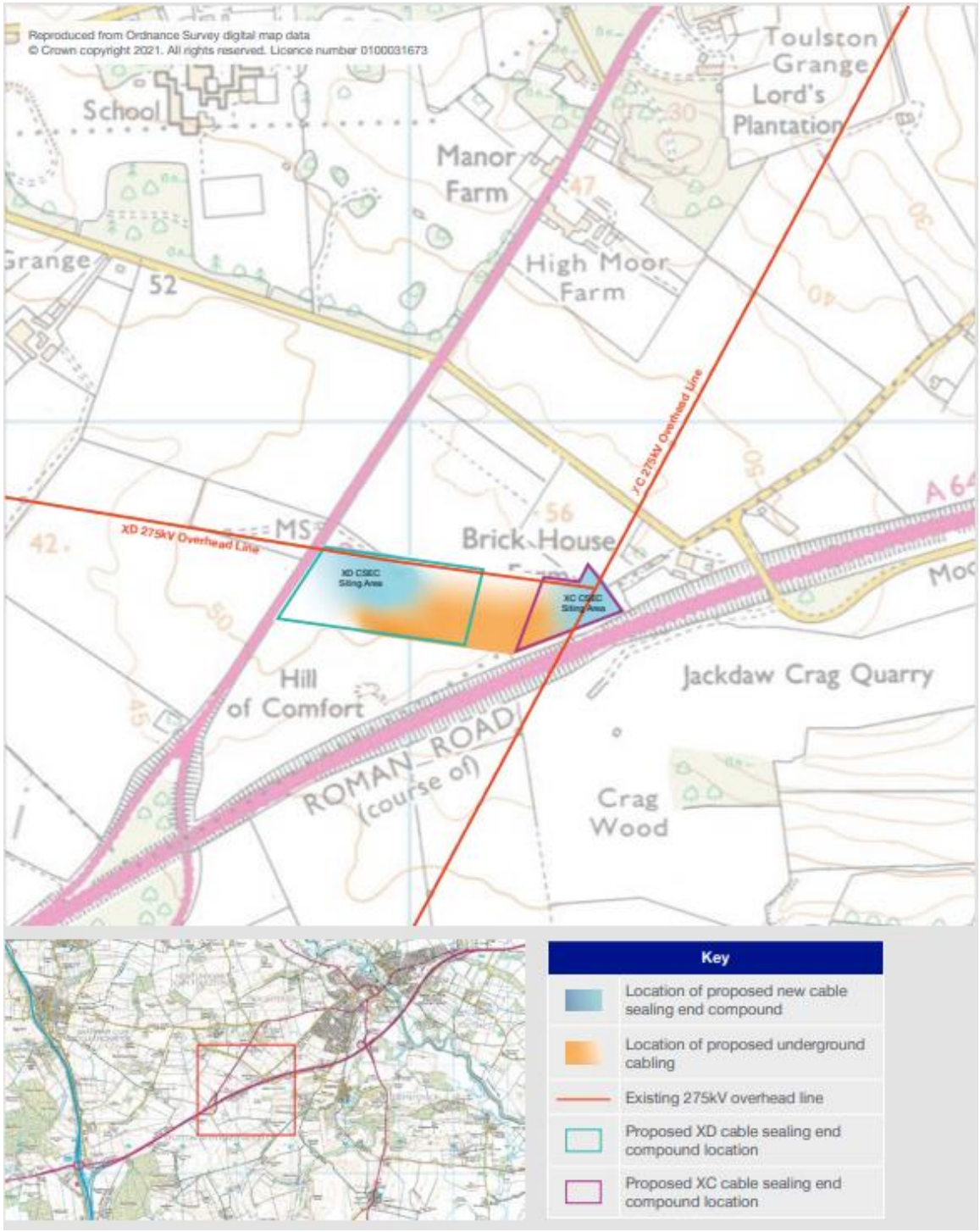
6.10.15 For the XC overhead line a Siting Area at the junction of the existing XC and XD overhead lines was identified as the preferred Siting Area and considered to align most closely with the Horlock Rules. On the XD overhead line a Siting Area east of the A659 was identified as the preferred Siting Area from a landscape and visual perspective due to the proximity to the A64.

### *Preferred Option*

6.10.16 The two preferred Siting Areas selected are located in the land between the A64 and A659, with the XD preferred Siting Area east of the A659 and the XC preferred Siting Area at the junction of the XC and XD overhead lines (see **Figure 6.3** below).

6.10.17 Overall, the Siting Areas were selected as the preferred option due to their close proximity to each other and limited environmental and technical constraints and good access, which would mean the potential impacts on the environment and local community could be limited, where possible. These options were also preferable from an engineering perspective. These Siting Areas were taken forward to consultation.

## Figure 6.3 – Preferred locations for CSECs at Tadcaster




*Design changes in responses to Statutory consultation feedback*

6.10.18 Stakeholder feedback put forward a change in the Tadcaster Area to move the replacement pylon XD001 into the adjacent field to the west or further east towards the field boundary to minimise effects on farm operations. Three options were considered:

- 1) move the pylon to the adjacent field to the west;
- 2) move the pylon further east to the field boundary; or
- 3) move the pylon slightly further east.

6.10.19 In terms of landscape and visual effects, compared with the statutory consultation design, Option 1 was the most preferred as the pylon would be reduced in height and would move further away from the nearest visual receptor. Option 2 was the least preferred as the taller pylon proposed under this option would have the potential to increase visual effects on the nearest visual receptor. Effects from Option 3 would be similar to the statutory consultation design.

6.10.20 However, in terms of impacts on agricultural operations, Option 2 was most aligned with the stakeholder request with Option 3 the next preferred option as this would bring the pylon closer to the field boundary and minimise land take and sterilisation of land further to the south. Option 1 was least preferred as it would move the CSEC further into the middle of the field increasing impacts on farm operations south of the field boundary with a greater length of underground cable and therefore soil disturbance. Overall, Option 3 was most preferred and was selected because it would have the least impact on the adjacent pylons along the existing overhead line, would minimise construction works, contribute towards meeting the stakeholder request and would not increase visual effects compared to those reported in the PEIR at statutory consultation.

6.10.21 Stakeholder feedback put forward a proposed change to remove the northern construction compound at Tadcaster and increase the size of the southern compound in order to avoid effects on farm operations at the proposed northern compound location. Following further design work in the surrounding area, National Grid has removed one of the compounds proposed at Tadcaster, leaving a single construction compound, in line with a landowner's request. The single construction compound is to be located in the southern field, as this avoids the need for construction traffic to track underneath existing and temporary overhead lines, as well as being in close proximity to the cable sealing end compound and cable run.

6.10.22 Stakeholder feedback put forward a proposed change to re-route the underground cable between the CSECs in order to minimise effects on farm operations. This change could not be accommodated within the Project design due to the presence of a medium pressure gas main pipeline which will need to be diverted in order to construct the Project. A high-pressure gas pipeline is also present in this area and therefore limited space is available to avoid the high pressure gas pipeline, divert other third party utilities and install the underground cable. For these reasons this change was not implemented as part of the design.

### *Final Design*

6.10.23 Two new CSECs will be installed in the Tadcaster Area: Tadcaster Tee East 275kV CSEC and Tadcaster Tee West 275kV CSEC with approximate footprints of 40m by 50m (2,000m2) and 31m x 37m (1,150m2) respectively. A short section (approximately 350m) of underground cable will connect to the two CSECs (see **Figure 3.4, Volume 5, Document 5.4.3**) and the **Design Drawings, Volume 2, Document 2.15**.

*Proposed landscape strategy at Tadcaster*

6.10.24 At Tadcaster, new planting is proposed to mitigate localised landscape and visual effects, considering technical constraints including underground services and to maximise the retention of productive agricultural land. The area of planting form part of the overall landscape strategy and will also contribute to Biodiversity Net Gain (BNG) (**Chapter 6: Landscape and Visual Amenity, Volume 5, Document 5.2.6** and **Biodiversity Net Gain Report, Volume 7, Document 7.9**). These measures are summarised as follows and shown on **Figure 3.11, Volume 5, Document 5.4.3** and the

outline landscape mitigation strategy is secured through Requirement 8 of the **draft DCO** (**Volume 3, Document 3.1**).

- Native scrub planting on the embankments around the eastern CSEC close to the A64 to soften the appearance of the engineered embankment as perceived form the A64.
- Reinforcement of existing field boundary hedgerows along the edge of the A659 and reinstatement of a historic hedgerow north of the proposed access track to the western CSEC to partially restrict views from the A659 and Garnet Lane of the lower parts of the western CSEC.
- Establishment of a new native hedgerow along the boundary with the A64 highway verge to partially restrict views from the A64 of the lower parts of the eastern CSEC and associated embankments.
- Introduction of species rich meadow planting in the field adjacent to the A64 highway verge, currently used for cultivating Christmas trees. Given the extent of new underground services and associated easements, this area could no longer be cultivated for tree planting. In addition to enhancing green infrastructure and landscape character this proposal will also contribute to Biodiversity Net Gain.

6.10.25 The planting proposals reflect the location of the proposals within the Locally Important Landscape Area (a non-statutory local landscape designation). Policies that apply include Policy SP18 Protecting and Enhancing the Environment and Policy SP19, Design Quality of the Selby District Core Strategy Local Plan (2013). Preferred Approach SG5, NE2 and NE3 of the Selby draft Local Plan Preferred Options (Jan 2021) also apply covering protection and enhancement of landscape character and green infrastructure.

6.10.26 Further information regarding the assessment of landscape and visual effects is provided in **Chapter 6: Landscape and Visual Amenity, Volume 5, Document 5.2.6**.

## 6.11 Design of the substations – Overton and Monk Fryston

### Overton Substation

*Options*

6.11.1 At York North, four Corridors (A, B, C, and D) were identified for the proposed 400kV and 275kV overhead lines. Corridor section (A1) was also identified to provide options to connect with the far western extent of the existing XCP overhead line. A total of 12 Siting Areas were identified for the proposed Overton Substation. Given that the proposed components of York North were intrinsically linked, the options appraisal process considered 21 different combinations of the corridors and Siting Areas (see Table 4.1 of the CPRSS, **Volume 7, Document 7.8**).

6.11.2 Following the identification of these 21 options, a screening exercise was undertaken to identify the least preferred options. As a result, four options in Corridor A and five options in Corridor B were screened out. In general, this was due to factors such as longer lengths of overhead line required, limited highways access to Substation Siting Areas, potential landscape and visual effects on residential areas and landscape impacts on the River Ouse Corridor. The remaining 12 options were then considered further.

6.11.3 **Figure 2.4 (Volume 5, Document 5.4.2)** illustrates the locations of the four route corridors. Further information on how these were identified can be found in Section 1.1 of the CPRS Study.

### *Preferred Option*

*Holford Rules and Horlock Rules appraisal*

6.11.4 In considering the route corridor options against the Holford Rules, all route corridors accorded with Rule 1 as they avoided major areas of highest amenity value. It was assumed that a route could be identified within each corridor to avoid smaller areas of high amenity value to meet the requirements of Rule 2. Corridor B was the shortest and most direct of the options and therefore considered most closely to accord with Holford Rule 3. With regard to Rule 4, the northern part of Corridor A was larger in landscape scale and more open and therefore more pylons may be visible against a sky background. The skyline of this landscape is however not particularly distinctive or prominent and is already influenced by vertical infrastructure. Due to the flat landscape context, Holford Rule 6 would not differentiate between the options. Holford Rule 7 was not considered to be applicable to this study as this relates to routing overhead lines in urban areas. Overall Corridor B was considered to best align with the Holford Rules.

6.11.5 With regard to the Horlock Rules, substation Siting Areas appraised would impact on any nationally valued landscapes. Within each of the Siting Areas it was considered possible for infrastructure to be sited to avoid areas of local amenity value. The greatest opportunity to take advantage of existing screening provided by vegetation was provided by alternative substation locations to the south of Hurns Gutter and north of Skelton located east and west of the A19. However, neither of these sites were considered to align closely with the supplementary note of the Holford Rules to *"avoid routeing close to residential areas as far as possible on grounds of general amenity"* as they would require large terminal structures near to residential areas. The Siting Areas which had the least number of opportunities to take advantage of existing screening were options located north of the River Ouse. These Siting Areas were located close to the River Ouse Corridor and were slightly elevated in relation to the river, with little intervening vegetation cover. Furthermore, whilst other Siting Areas, including the preferred Overton Substation Siting Area, had fewer opportunities to take advantage of existing screening, the study found that additional mitigation in the form of earth mounding/planting could be implemented to help mitigate effects.

*Preferred Option*

6.11.6 Following the appraisal, it was concluded that the preferred option for York North comprised:

- Corridor B (**Figure 6.2**) as the preferred route corridor to connect the new 400kV and 275kV overhead lines;
- A substation Siting Area (Overton Substation) located south of Shipton by Beningbrough, adjacent to the East Coast Mainline railway (ECML) and west of the A19.

*Design changes in responses to statutory consultation feedback*

*Overton Substation: Location, layout and access*

6.11.7 A number of alternatives were considered for the location of Overton Substation as well as in relation to the access to the substation. Two stakeholder responses were received specifically in relation to the location of Overton Substation. In considering these, consideration was also given to the alignment of the overhead lines which would need to connect into the substation.

6.11.8 Stakeholder feedback was received to re-orientate Overton Substation at its location south of the A19 so that the substation would be aligned parallel with the ECML. This was considered to minimise the loss of agricultural land and potential impacts on farm operations. Movement of the substation further north towards Overton Road also formed part of the request to reduce visual effects from the 275kV XC overhead line and pylons on receptors to the south. Making these changes to the substation would also require movement of the 400kV YN overhead line further to the east. This change was not incorporated into the Project design for the following reasons:

- the presence of a water main pipeline below the substation site would prevent some of the changes being implemented;
- the re-orientation of the substation would have moved it into flood zones which would not meet policy tests as alternatives sites are available outside of flood
- the changes required to the YN overhead line would have increased negative landscape and visual effects on receptors to the east of the overhead line (Hall Moor Farm cottages and Hall Moor Farm South); and
- the construction works would have increased in complexity due to works taking place in closer proximity to the ECML. The space needed to construct the substation between the ECML and substation would have reduced.

6.11.9 Stakeholder feedback was also received to move Overton Substation to the north of the A19 due to stakeholder concerns regarding potential visual effects and the suggestion that the alternative site would be better screened by existing vegetation around its boundary. Moving the substation further north would require realignment of all three overhead lines connecting into the substation from the north and south. This would require additional pylons on the 275kV SP and XC overhead lines and one less pylon on the 400kV YN overhead line, with an overall net increase in the number of pylons. This change was not incorporated into the Project design for the following reasons:

- Flood modelling indicated that there was a greater risk of flooding at the alternative site, with part of the site falling within flood zone 2; and
- Although the alternative substation would have been better screened by existing vegetation, measures would still be needed within the substation site to mitigate landscape and visual effects, in particular landscape planting and bunding around the northern half of the site. Initial flood modelling indicated that the boundary along which these measures were required was at greater risk of flooding and therefore it may not be possible to implement such measures without increasing flood risk further.
- The alternative design increased the overall number of pylons with the introduction of a new angle tower south of the substation increasing landscape and visual effects, reducing compliance with the Holford Rule 3. Furthermore, a concentration

of wirescape (Holford Rule 6) would have likely resulted from the alternative option, which would have potentially increased visual effects with an increase in pylon visibility and complexity of wirescape perceived from the south-east edge of Shipton and the A19.

- The alternative site could result in greater effects on biodiversity with the potential loss of priority habitat and effects on protected species which may use habitats along the watercourses bordering the site.
- The alternative design could increase effects on land holdings due to the increased number of pylons, and this could also result in increased costs.

6.11.10 Although the alternative designs for Overton Substation were not implemented, changes were made to the substation to reduce its overall footprint. The initial design allowed for a worst-case footprint to allow for all potential equipment needed in the substation layout. Following further review of the engineering design it was determined that this was not required and the substation footprint was reduced and the distance between the substation and watermain pipeline increased.

6.11.11 Overton Road is part of the Sustrans National Cycle Network (NCN 65), and concerns were raised for the safety of users of this route having to travel along Overton Road alongside construction vehicles accessing the construction compounds either side of the road near Overton Substation. Therefore, changes were made to the design in order to provide an alternative cycle route and a surfaced off-road diversion route was incorporated into the Project design allowing users to bypass Overton Road between its junction with the A19 and where this Sustrans route crosses the ECML. In addition, as part of a subsequent design change as a result of stakeholder feedback, the access into the Overton Substation site was revised in order to minimise construction traffic travelling along the single-track Overton Road.

6.11.12 Stakeholder feedback was also received to move the pylons closest to the substation (YN008, XC416 and SP003) as close to existing field boundaries as possible to minimise effects on farm operation. YN008 could not be moved due to the presence of a watermain pipeline and the need to locate scaffolding over the A19. Pylons XC416 and SP003 could not be moved due to the technical constraints on the angle of the downleads from these pylons as they would connect into the substation as well as needing to achieve clearances to the ECML.

6.11.13 Stakeholder feedback from North Yorkshire County Council highways queried why access into Overton Substation could not be taken directly from the A19. An access to the A19 on the frontage of the Overton Substation was not considered appropriate due to the nature of the A19 in the area. The A19 is a 60mph two lane single carriageway. The frontage of the Overton Substation would be along a section of carriageway that is just prior to a bend on the A19 near the junction with Overton Road. It was considered that a new access in this location would introduce highways safety issues on the road when compared to using an established wide access at Overton Road. The Overton Road access has been in place for a long time and existing road users are aware of the junction, as it has warning and direction signs well in advance on the A19 and the speed of vehicles at this junction is naturally slower due to it being on the apex of a shallow bend on the A19.

### *Final Design*

6.11.14 The substation will have a footprint of approximately 60,000m$^2$ and contain four Super Grid Transformers (SGTs) which will convert the voltage levels. The SGTs will be

installed within concrete bunds. The substation will also contain two full line tension, and four gantries (two per overhead line) where each overhead line connects into the substation, as well as a control building It is assumed that both the substation equipment and gantries will be up to a maximum height of 15m above the finished ground level. Underground cabling within the substation will connect one Overton - Poppleton circuit from the overhead lines into the substation. The substation would be enclosed by an electrified palisade fence in line with National Grid standards (for further details please see the **Design Drawings, Volume 2, Document 2.15**). A small transformer compound, which would be operated by Northern Power Grid, would be located outside the perimeter of the substation and connected to the substation by a short section of underground cable. A permanent access road surfaced with impermeable pavement would provide access from Overton Road. This would be designed to accommodate the Abnormal Indivisible Loads (AIL) required to install the SGTs at the substation. Drainage measures would be incorporated into the design of the substation (**Flood Risk Assessment, Appendix 9D, Volume 5, Document 5.3.9D**) with an outfall to the Hurns Gutter. The substation would be unmanned on a permanent basis with regular maintenance visits to the Substation.

*Proposed landscape strategy at Overton Substation*

6.11.15 At Overton 400/275kV Substation, areas of planting and landscape bunding are proposed. The area of planting form part of the overall landscape strategy and will also contribute to Biodiversity Net Gain (BNG) (**Chapter 6: Landscape and Visual Amenity, Volume 5, Document 5.2.6** and **Biodiversity Net Gain Report, Volume 7, Document 7.9**). These measures are summarised as follows and shown on **Figure 3.10, Volume 5, Document 5.4.3** and the outline landscape mitigation strategy is secured through Requirement 8 of the **draft DCO, Volume 3, Document 3.1**:

- New native woodland planting and scrub on earth mounding up to 2m high with 1:3 slopes along the south side of the A19 between Overton Road and Hurns Gutter. Design objective to reduce the visibility of the Overton Substation from the A19;
- New native woodland planting and scrub on earth mounding up to 3m high with 1:3 slopes to the northwest of Overton Substation and Overton Road designed to allow retention of existing mature/veteran trees. Design objective to reduce the visibility of the Overton Substation from Overton Road, National Cycle Route 65 and the ECML;
- Reinforcement of existing hedgerows in sections along the A19 and Overton Road to comprise infilling of gaps and/or thickening and/or introduction of hedgerow trees. Design objective to reduce the visibility of the Overton Substation from Overton Road, National Cycle Route 65 and the A19.
- Introduction of species rich meadow planting around the Overton Substation boundary, under pylons to the north and south of the Overton Substation and in locations at the perimeter of the field in which the Overton Substation is sited, where there are limitations to productive arable cultivation due to the shape and size of the land parcels and/or likely poor drainage. Links to adjacent hedgerow and woodland planting provides enhanced green infrastructure potential and the species rich meadow planting will also contribute to Biodiversity Net Gain opportunities.

6.11.16 The landscape planting proposals have been developed to reflect Hambleton Local Plan (Adopted 2022) Policy E4 Green Infrastructure and Policy E7 Hambleton's Landscapes. The landscape bunding will be developed using spoil excavated within the Order Limits at Overton 400/275kV Substation. Further information regarding the assessment of

landscape and visual effects and the embedded measures proposed is provided in **Chapter 6: Landscape and Visual Amenity, Volume 5, Document 5.2.6**.

## Monk Fryston Substation

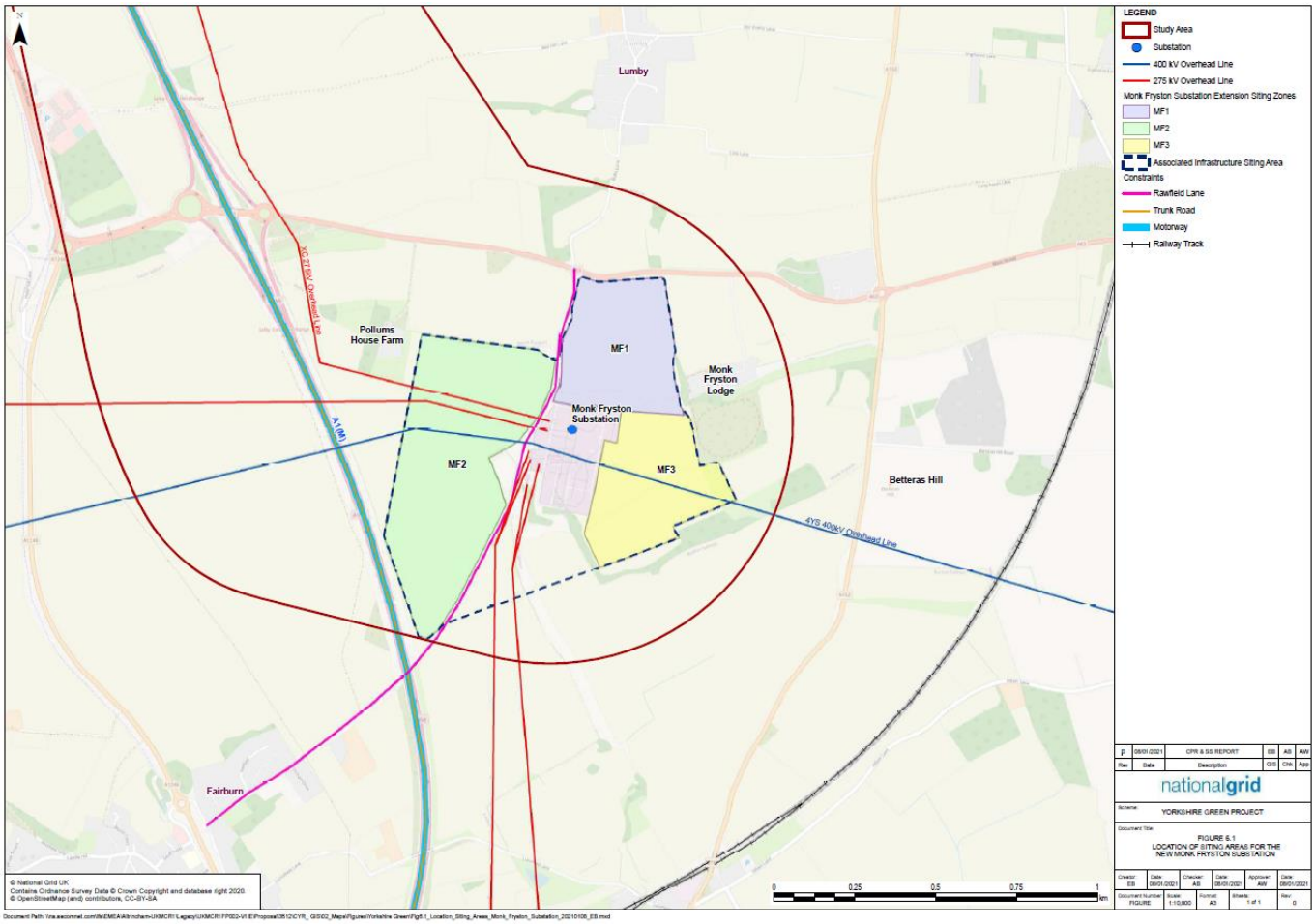
### *Options*

6.11.17 The new substation is required as the existing substation equipment is only rated to take a certain amount of power, and the increased rating of the XC overhead line would be above the capability of the equipment at the existing substation so cannot be used.

6.11.18 Three Siting Areas for a new substation at Monk Fryston were identified (see **Figure 6.4** below). These comprised locations to the east and north of the existing substation and west (on the opposite side of Rawfield Lane to the existing substation).

6.11.19 With regard to the Horlock Rules, none of the three Substation Siting Areas appraised would impact on any nationally valued landscapes (Horlock Rule 2). Within each of the Substation Siting Areas it was considered possible for infrastructure to be sited to avoid areas of local amenity value (Horlock Rule 4). All Siting Areas were considered to broadly align with the requirements of Rules 1 to 4 of the Horlock Rules.

**Figure 6.4 - Location of the three substation siting areas for the Monk Fryston Substation**



### *Preferred Option*

6.11.20 A location to the east of the existing Monk Fryston Substation was selected as the preferred Siting Area for the new substation.

6.11.21 Potential impacts associated with physical environment, tourism and recreation, settlement and population and land use were considered to be indiscernible across all three Siting Areas. All three potential Siting Areas considered were located within largely pasture and arable land and would be likely to have similar effects in terms of biodiversity and landscape and views.

6.11.22 All three Siting Areas are located within the Fairburn and Newton Ings SSSI Impact Risk Zone. There are two ponds in the area, one adjacent to the pylon located at Beterras Hill which has the potential to be impacted by all options. An additional pond located to the south east of the existing substation may be indirectly impacted by Siting Areas to the east (preferred option) and west of the existing substation.

6.11.23 For landscape and visual all three Substation Siting Areas were considered broadly within the same degree of impact with the potential for locally significant visual effects. All three Siting Areas were considered to be low to moderately constrained in landscape and visual terms. However, it was identified that there were opportunities for mitigation through more detailed assessment, siting and construction, which would reduce the potential for significant landscape effects. For the Siting Areas to the north and west it was acknowledged that underground cables and overhead lines around the proposed 400kV substation may constrain what is possible in terms of mounding and planting for landscape mitigation and visual screening purposes. Whereas for the preferred Siting Area the proximity to Monk Fryston Lodge and underground cables around the substation would greatly constrain what is possible in terms of screen mounding and/ or planting to the north east of the new substation and sealing end compound.

6.11.24 For the Siting Areas to the north and west the potential for adverse visual effects was identified, but the lower parts of the substation could, over time, be screened by a combination of appropriate mounding/false cuttings and mitigation planting, noting that for the Siting Area to the west mounding/false cuttings may require comparable greater extent of earthworks due to the sloping nature of the field. For the preferred Siting Area it was acknowledged that this option would maximise the filtering/screening benefit of existing vegetation to the south of the siting zone which would screen the lower parts of the development from some views.

6.11.25 For all three Siting Areas it was concluded that the upper parts of the substation would continue to be visible from properties and settlements in the surrounding local area. For the Siting Area to the north, views from most properties of the upper parts of the substation would be in combination with the existing substation and as such these would appear as one, particularly in longer distance views. Some locally significant residual visual effects would therefore be likely. For the Siting Area to the west the upper parts of the substation would continue to be visible from properties and settlements in the surrounding local area. In short distance views of the substation may appear slightly disjointed from the existing substation however, longer distance views to the existing substation and new substation may appear as one. Some locally significant residual visual effects would therefore be likely. For the Siting Area to the east (preferred) views of the upper parts of the substation would be in combination with the existing substation and as such these would appear as one, particularly in longer distance views.

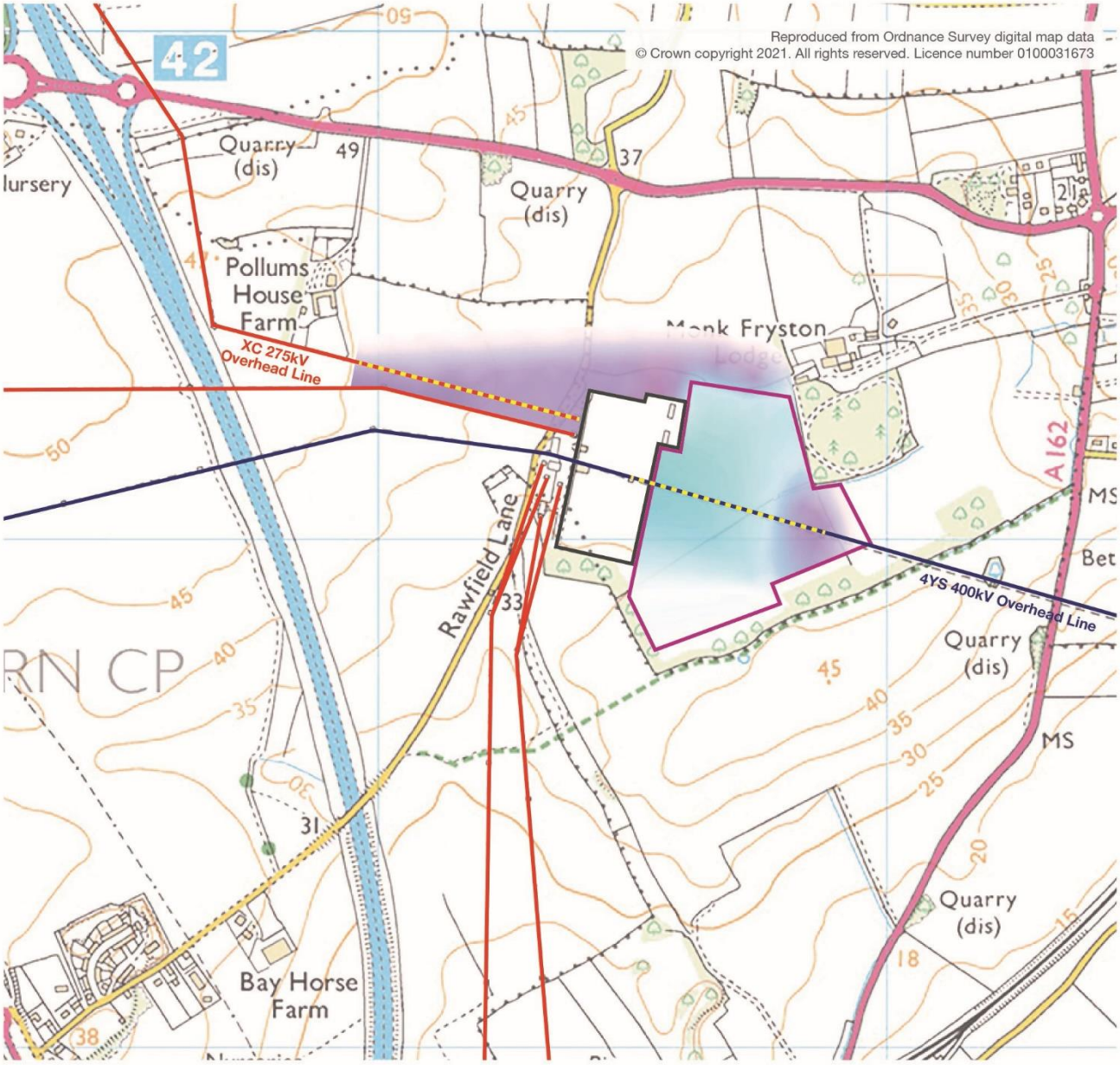
6.11.26 With regards to historic environment effects, the preferred Siting Area was not preferred in relation to impacts on the historic environment due to its proximity to, and potential effects on the setting of Monk Fryston Lodge, a Grade II listed building located to the east. However, it was considered with appropriate planting and landscaping these effects could be mitigated.

6.11.27 In relation to traffic and access, all the Siting Areas considered could be accessed from Rawfield Lane.

6.11.28 From an engineering perspective, the preferred Siting Area was selected as it provided a location where a less complex and cost effective solution to connect with existing infrastructure could be provided. This included shorter and fewer cable routes as a substation at the preferred Siting Area could be connected to the existing Monk Fryston 275kV/400kV substation via busbars; shorter lengths of new overhead line would be required compared to the other Siting Areas and existing access roads could be used to access the site.

6.11.29 The preferred Siting Area was then taken forward to consultation.

## Figure 6.5 - Preferred location for Monk Fryston Substation




**Key**

- Proposed location of associated infrastructure connecting to proposed, new MF3 substation
- Proposed location of new substation
- Existing 275kV overhead line
- Existing 400kV overhead line
- Partial removal of the existing 275kV XC/XCP overhead line (Poppleton to Monk Fryston)
- Partial removal of the existing 400kV 4YS overhead line (Monk Fryston to Eggborough)
- Proposed MF3 substation location
- Existing Monk Fryston substation

*Design changes in responses to Statutory consultation feedback*

*Final Design*

6.11.30 A new 400kV Substation will be installed adjacent to (and connecting into) the existing Monk Fryston 400/275kV Substation to enable the uprated XC overhead line to connect into the Electricity Transmission System (see **Figure 3.6, Volume 5, Document 5.4.3**). The proposed substation would have a footprint of approximately 90,000m$^2$ and is likely to be similar in height to the buildings and infrastructure at the existing substation (assumed for the purposes of assessment to be 15m). The new substation would contain four super grid transformers (SGTs) within concrete bunds to step up the 275kV voltage of the XC overhead line to 400kV to connect into the new substation. Underground cables (approximately 600m in length) would be installed within the substation to connect one circuit of the XC overhead line to the substation. The new substation would also contain switchgear and equipment, a control building housing equipment and car parking. The substation would be enclosed by an electrified palisade fence in line with National Grid standards (for further details please see the **Design Drawings, Volume 2, Document 2.15**). A small transformer compound, which would be operated by Northern Power Grid, would be located inside the perimeter of the substation and connected to the substation by a short section of underground cable. Drainage measures will be incorporated into the design of the substation (**Appendix 9D: Flood Risk Assessment, Volume 5, Document 5.3.9**). At this stage of the assessment it is assumed the substation would be unmanned on a permanent basis with regular maintenance visits to the substation.

*Proposed landscape strategy at Monk Fryston Substation*

6.11.31 To minimise the visual and landscape effects of the proposed Monk Fryston Substation, areas of planting are proposed. These are summarised as follows and shown on **Figure 3.12, Volume 5, Document 5.4.3** and the outline landscape mitigation strategy is secured through Requirement 8 of the **draft DCO (Volume 3, Document 3.1**):

- New native woodland planting and scrub on earth mounding up to 3.5m high with 1:3 slopes to the north of the Monk Fryston Substation. The design objective is to reduce the visibility of the Monk Fryston Substation from parts of Rawfield Lane, the A63, the curtilage of Monk Fryston Lodge and high sensitivity receptors to the north including PRoW near Lumby.
- New native woodland planting and scrub on earth mounding up to 3.5m high with 1:3 slopes to the southeast of the Monk Fryston Substation considering the location of the consented battery storage scheme (Ref 2021/0633/FULM). The design objective is to reduce the visibility of the Monk Fryston Substation from the nearby public footpath to the south noting that an existing woodland belt closer to the footpath would be maintained as part of the Project.
- New native woodland planting and scrub on earth mounding up to 3.5m high with 1:3 slopes to the east of the Monk Fryston Substation to reinforce the establish landscape character pattern of significant woodland cover and to reinforce existing woodland screening around Monk Fryston Lodge to the northeast.
- Re-establishment and reinforcement of historic field boundary hedgerows to the east of the Monk Fryston Substation to mitigate hedgerow loss under the footprint of the proposed substation and to enhance green infrastructure.

- Re-establishment of part of a historic field boundary hedgerow along a section of Rawfield Lane under the new XC overhead line where tree planting is not possible to partially screen views of the northwestern end of the proposed Monk Fryston Substation from Rawfield Lane and Pollums House Farm.
- Introduction of species rich meadow planting between the mounds and Proposed Monk Fryston Substation where the small piecemeal parcels of residual farmland could not be efficiently cultivated for arable crops. In addition to enhancing green infrastructure and landscape character this proposal will also contribute to Biodiversity Net Gain.
- The planting proposals reflect Policy SP18 Protecting and Enhancing the Environment and Policy SP19, Design Quality of the Selby District Core Strategy Local Plan (2013). Preferred Approach SG5, NE2 and NE3 of the Selby draft Local Plan Preferred Options (Jan 2021) also apply covering protection and enhancement of landscape character, green infrastructure, and tree coverage.

6.11.32 Further information regarding the assessment of landscape and visual effects is provided in **ES Chapter 6: Landscape and Visual Amenity** (**Volume 5, Document 5.2.6**).

## 6.12 Summary

6.12.1 The purpose of this Chapter of the DAS has been to provide an overview of the design evolution of those key components of the Project. This Chapter has sought to demonstrate how the design principles have informed the design evolution of the overhead lines aspects of the Project route as wells as the non-linear elements of the Project (CSECs and substations). This Chapter has also sought to demonstrate how National Grid has duly considered consultation feedback and change requests and made amendments where feasible and justified, and how National Grid has sought to design a sustainable proposal which will be durable and adaptable and which is sensitive to its local environment, demonstrated through the mitigation of potential adverse effects.

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# 7 Conclusions

7.1.1 The current National Grid high-voltage electricity network in Yorkshire does not have the capacity to transport all the new low-carbon energy that is expected to come online from renewable energy over the next 10 years (50GW), while operating reliably and securely to the standards required.

7.1.2 Without additional reinforcement, the existing transmission system would become overloaded. Network reinforcement is therefore required in order to address future system flows across the boundaries of the transmission system and ensure security of supply.

7.1.3 EN-1 recognises that the new electricity generating infrastructure that the UK needs to move to a low carbon economy while maintaining security of supply will be heavily dependent on the availability of a fit for purpose and robust electricity network. That network will need to be able to support a more complex system of supply and demand than currently and cope with generation occurring in more diverse locations.

7.1.4 Paragraph 4.5.1 of EN-1 explains that whilst visual appearance is sometimes considered to be the most important factor in good design, 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. Applying "good design" to energy projects should produce sustainable infrastructure sensitive to place, efficient in the use of natural resources and energy used in their construction and operation, matched by an appearance that demonstrates good aesthetic as far as possible. However, the guidance acknowledges 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.

7.1.5 Paragraph 4.5.3 goes on to explain that in light of the above, and the importance which the Act[1] 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. The Secretary of State should satisfy himself that the applicant has taken into account both functionality (including fitness for purpose and sustainability) and aesthetics (including its contribution to the quality of the area in which it would be located) as far as possible. 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, landform and vegetation. Furthermore, for elements of the Project that are not electrical equipment, such as control buildings, the final selection of materials would reflect local vernacular as far as possible ensuring that such development contributes to the quality of the area.

7.1.6 National Grid has invested significant time in developing and defining the Project informed by technical, financial, environmental and socio-economic considerations. The Project has been in development since 2019 and has evolved in an iterative manner, informed by the above considerations and consultation with key stakeholders, local residents and land owners.

7.1.7 As identified in Paragraph 4.5.3 of EN-1[10], National Grid has limited choice in applying principles of good design in relation to aesthetics. Much of the infrastructure proposed by National Grid is restricted in terms of its form by operational and technical requirements. Therefore the design principles adopted by National Grid relate very much to defining routes and selecting sites which will minimise adverse environmental and socio-economic impacts.

7.1.8 In evaluating options for the Project e.g. pylon type, route alignment and substation/CSEC locations, due regard has been given to the key criteria as set out in National Grid's Statutory and Licence Obligations of efficiency, coordination, economy and amenity, the latter includes environmental and socio-economic issues.

7.1.9 The alignment of the overhead line has been identified through routing and siting studies carried out in accordance with the Holford Rules. These guidelines ensure that in the development of options consideration is given to environmental issues from the earliest stage in order to balance the technical benefits. The design philosophy adopted for the Project adheres to the requirements and expectation placed upon National Grid i.e. to have regard to the built and natural environment when discharging its statutory duty as a licence holder under the Electricity Act[9].

7.1.10 National Grid is aware of the impact of new overhead transmission lines on the landscape and local communities. Therefore significant time and resources have been applied to defining the most appropriate route and technological solution which accords with the Statutory Duties of maintaining an efficient, coordinated and economical electricity transmission system and considering the desirability of preserving amenity and minimising impacts on communities, landscape and visual amenity, cultural heritage and ecological resources.

7.1.11 Where technical requirements have permitted, National Grid has sought to review and identify the most appropriate locations for new site-specific elements of the Project including Overton Substation, Monk Fryston Substation and the CSECs at Shipton and Tadcaster. The identification of appropriate locations has been informed by the Horlock Rules. The layout of the substations is determined by functionality.

7.1.12 The infrastructure has been designed to take into account climate change and to ensure that it will be resilient over its anticipated operational lifespan. The design of the CSECs, Overton Substation, Monk Fryston Substation and overhead line routes have all been subject to Flood Risk Assessments (**Volume 5, Document 5.3.9D**). The resultant ground levels for this infrastructure have all been designed so as to into account changes to flood levels associated with Climate Change.

7.1.13 National Grid, through the application of the Holford and Horlock Rules and underground policy are able to demonstrate that they have applied the principles of good design in terms of siting relative to existing landscape character, landform and vegetation.

7.1.14 It is concluded that this DAS demonstrates that the Project satisfies the Good Design criteria identified within NPS EN-1[10] and EN-5[11].

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