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Design and Access Statement

National Grid (North Wales Connection Project)

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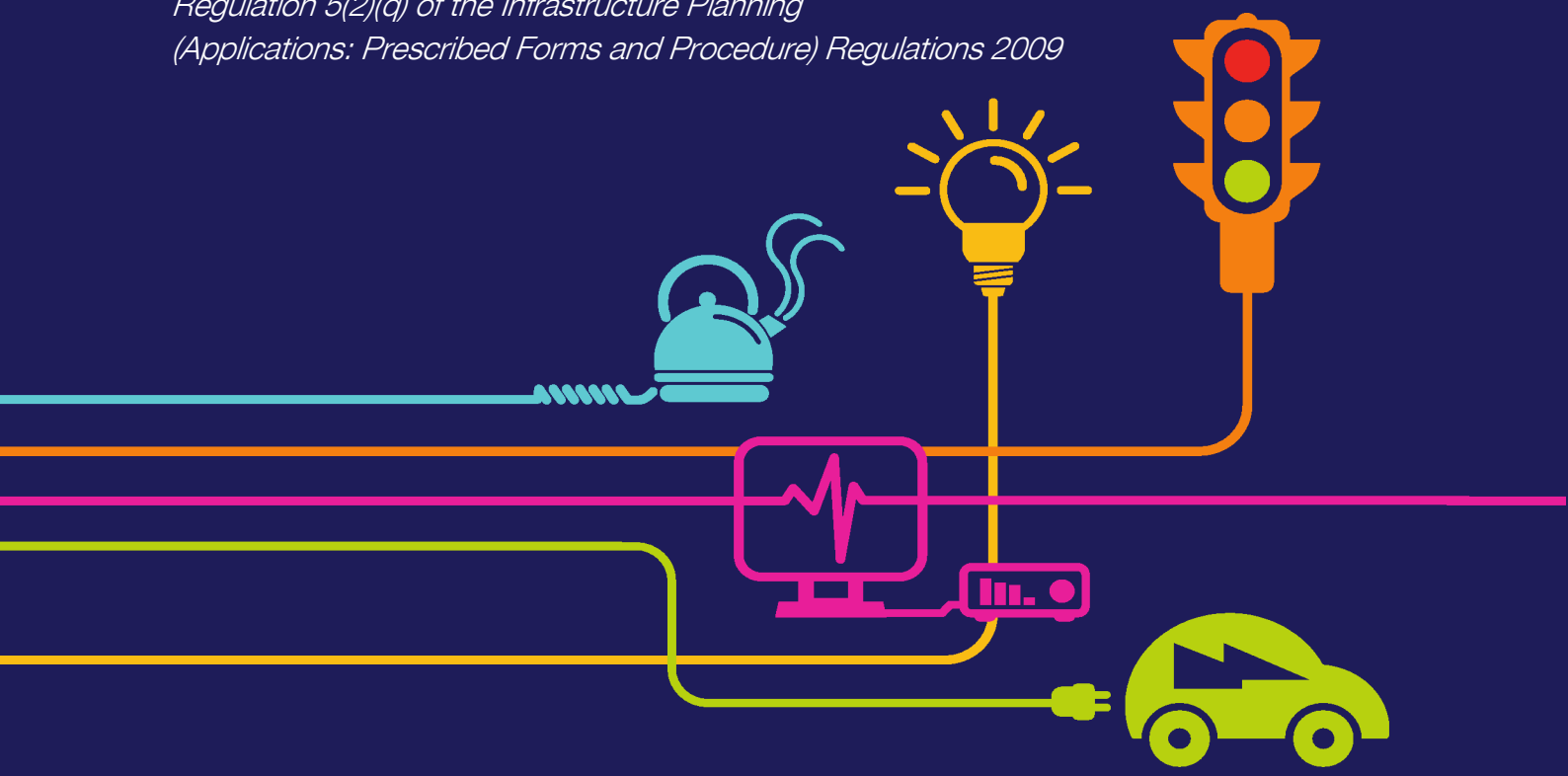

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Executive Summary

This Design and Access Statement (DAS) accompanies an application for a Development Consent Order (DCO) by National Grid Electricity Transmission (plc) (National Grid) to seek powers to construct, operate and maintain a new 400,000 volt (400 kilovolt (kV)) connection between Wylfa Substation and Pentir Substation, together with various associated development and other works ('The Proposed Development'). This would facilitate the export of power from the proposed Wylfa Newydd Power Station. The Proposed Development is known as the North Wales Connection Project.

The purpose of this DAS is to demonstrate how National Grid has taken into account the criteria for good design contained within National Policy Statements EN-1 (Overarching National Policy Statement for Energy) and EN-5 (National Policy Statement for Electricity Networks Infrastructure).

The DAS describes the design of the various components of the Proposed Development in a proportionate way. The document also summarises how the design of the Proposed Development has evolved and details the design and access arrangements of the THH/CSECs at Braint and Tŷ Fodol and the modifications extensions at the existing Wylfa Substation and Pentir Substations extension.

It is concluded that National Grid has designed the Proposed Development to be adaptable and durable to climate change. National Grid, through the application of the guidelines on the siting and design of infrastructure is able to demonstrate that the principles of good design have been applied in terms of siting relative to existing landscape character, landform and vegetation.

It is concluded that the Proposed Development satisfies the Good Design criteria identified within NPS EN-1 and EN-5.

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1 Introduction

1.1.1 This Design and Access Statement (DAS) accompanies an application for a Development Consent Order (DCO) by National Grid Electricity Transmission (plc) (National Grid) to seek powers to construct, operate and maintain a new 400,000 volt (400 kilovolt (kV)) connection between Wylfa Substation and Pentir Substation, together with various associated development and other works ('The Proposed Development'). This would facilitate the export of power from the proposed Wylfa Newydd Power Station. The Proposed Development is known as the North Wales Connection Project.

1.1.2 The Proposed Development consists of the following principal components:

- extension to the existing substation at Wylfa;
- sections of new 400 kV overhead line (OHL) between Wylfa Substation and Braint Tunnel Head House (THH) and Cable Sealing End Compound (CSEC) on Anglesey including modifications to parts of the existing 400 kV OHL between Wylfa Substation and Pentir Substation;
- Braint THH/CSEC on Anglesey;
- a tunnel between Braint and Tŷ Fodol THHs;
- Tŷ Fodol THH/CSEC in Gwynedd;
- new section of OHL connection between Tŷ Fodol THH/CSEC and Pentir Substation;
- extension to the existing substation at Pentir; and
- temporary construction compounds, access tracks, construction working areas, localised widening of the public highway and third party works required to construct the infrastructure listed above.

1.2 PURPOSE OF THIS DESIGN AND ACCESS STATEMENT

1.2.1 This DAS is one of a suite of documents submitted as part of the application for a DCO for the Proposed Development. The DAS is submitted to inform the consideration of the application with regard to design and access matters.

1.2.2 Whilst there is no statutory requirement for a DAS to be produced to accompany a DCO, paragraph 4.5.4 of the Overarching National Policy Statement (NPS) for Energy (EN-1) (Ref 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[1] 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 PINS Advice Note 6 (Preparation and Submission of Application Documents) (Ref 2) advises that 'other documents' may include information that the applicant would normally want to submit for the development proposal or that which has been requested or suggested by respondents to pre-application consultation and publicity, and which the applicant wishes to include. It cites a number of examples, including a Planning Statement and DAS. This DAS is supplied to assist in the understanding of how the Proposed Development design process has evolved.

1.2.4 The nature of much energy infrastructure development will often limit the extent to which it can contribute to the enhancement of the quality of the area. Section 4.5.1 of NPS EN-1 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.'

1.2.5 This DAS is provided to demonstrate how National Grid has taken into account the criteria for good design contained within EN-1 (Ref 1) and EN-5 (Ref 3). The DAS describes the design of the various components of the Proposed Development in a proportionate way. The document also summarises how the design of the Proposed Development has evolved and details the design and access arrangements of the THH/CSECs at Braint and Tŷ Fodol and the extensions at the existing Wylfa and Pentir Substations.

[1] Note that the IPC has now been replaced by the Planning Inspectorate (PINS)

1.3 DAS REQUIREMENT AND CONTENT

1.3.1 As stated above, there is no specific statutory requirement for a DAS for DCO applications and there is therefore also no guidance as to what a DAS, if prepared, needs to cover.

1.3.2 In the absence of any guidance on the requirements of a DAS submitted with DCO applications, reference has been made to guidance set out in Technical Advice Note (TAN) 12 Design (Ref 4) and Design and Access Statements in Wales (Ref 5).

1.3.3 In accordance with the requirements set out in these two documents this DAS:

- 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.

1.3.4 This DAS should be read in conjunction with the plans submitted with the DCO application (**Volume 4**), the Environmental Statement (ES) (**Volume 5**), the Consultation Report (**Volume 6**) and the Design Report (**Document 7.17**).

1.3.5 The design of the Proposed Development has been informed by the design principles that are set out in this DAS. The draft DCO contains a number of proposed requirements. The purpose of these DCO requirements is to ensure that all subsequent detailed design work complies with the parameter plans and design principles.

1.4 DESIGN ENVELOPE

Order Limits

1.4.1 The Order Limits delineate the extent of the 'authorised development' for which development consent is being sought and are the full extent of area required to locate and construct the Proposed Development pursuant to the DCO. The Order Limits are illustrated on Figure 1.

Limits of Deviation and Parameters

1.4.2 As recognised within the Planning Inspectorate's Advice Note 9 (Ref 6) which deals with the 'Rochdale Envelope' a necessary and proportionate degree of flexibility often needs to be incorporated into the design of a development so that unforeseen issues encountered after a development has been consented can be addressed without the need for re-application. In this instance, for example, a pylon may need to be re-sited if previously unidentified poor ground conditions were found on site, or significant unrecorded archaeological remains were identified. To allow for this necessary flexibility, Limits of Deviation (LOD) are being applied for within the permanent elements of the 400 kV OHL would be located.

1.4.3 In respect of the OHL, LOD are not only applied horizontally, but also vertically, to allow for pylons to be increased in height if necessary, for example to allow for an increase in span length whilst still maintaining required ground clearance.

1.4.4 Both horizontal and vertical (below ground) LOD are also applied to the tunnel; though the vertical element applies to a minimum depth below the top of the bedrock and not a maximum depth.

1.4.5 This horizontal LOD for the tunnel sets the envelope within which the permanent tunnel alignment would be located. This is required to provide the necessary and proportionate flexibility to adjust the alignment of the tunnel should problematic ground conditions be identified. The horizontal LOD is shown on Works Plans DCO_F/WO/PS/01 to DCO_F/WO/PS/05 (**Document 4.4**).

1.4.6 The vertical LOD for the tunnel relates to the minimum cover to the top of the bedrock. The tunnel may deviate downwards as necessary or convenient, but would be limited by the need for safety and engineering efficiency.

1.4.7 Further details about the various aspects of flexibility relating to the OHL and Tunnel are provided in section 2.9 of this statement.

1.4.8 For non-linear works such as the THH/CSECs and substations, maximum parameters are applied that set the maximum design envelope for the works.

1.4.9 The DAS therefore describes the design principles that would be adopted throughout the implementation of the Proposed Development and the parameters that would be controlled through requirements in the draft DCO (**Document 2.1**). The detailed design would comply with the parameters and approach set out within this DAS and the ES Chapter 6, EIA Methodology and Basis of Assessment (**Document 5.6**).

1.5 MITIGATION MEASURES

1.5.1 National Grid has sought to identify mitigation to avoid or reduce adverse effects associated with the construction, operation, maintenance and decommissioning of the Proposed Development through design, and also through commitments to control and management measures to be deployed during construction. The development of measures to avoid or reduce the significant adverse effects of a project is an intrinsic part of the EIA process and, from the outset, the route selection process described in the Design Report (**Document 7.17)** has sought to take into account environmental constraints and to avoid effects as far as possible.

1.5.2 Potential design measures to avoid or reduce effects have been incorporated into the design of the Proposed Development. Further detail can be found in each of the topic assessments presented in the Environmental Statement (**Documents 5.7-5.18**).

1.5.3 Design measures, for example the sensitive routeing of the OHL and careful siting of the THH/CSECs, have been critical in avoiding or reducing a number of potential environmental effects. Where the design of the Proposed Development has been unable to resolve potentially significant effects, further mitigation measures have been identified for implementation. An important element of design mitigation has been the localised restriction of certain works within the Order Limits and LOD through commitments set out in the Schedule of Environmental Commitments (**Document 7.4.2.1**), which forms an appendix to the Construction Environmental Management Plan (CEMP) (**Document 7.4**). These committed measures are secured, through the CEMP (secured by Requirement 6) or through other management plans (also secured by Requirement 6), for example the Outline Materials Management Plan (**Document 7.12**) and the Outline Construction Traffic Management Plan (**Document 7.5**).

1.5.4 The THH/CSECs would be developed in general accordance with the design principles set out in the Design Guide Proposed Tunnel Head Houses & Permanent Site Landscaping hereafter referred to as the Design Guide (**Document 7.19**) as secured by Requirement 4 in the draft DCO (**Document 2.1**).

1.5.5 The Proposed Development includes landscaping mitigation measures within the Order Limits, in particular in relation to planting around the Braint and Tŷ Fodol THH/CSEC sites and Pentir Substation. The Proposals also include for replacement tree/hedgerow planting within the Order Limits.

1.6 DAS STRUCTURE

1.6.1 This remainder of this DAS is structured as follows:

- section 2: Overview of the Proposed Development – provides an introduction to National Grid, outlines the need for the Proposed Development and provides an outline of the elements comprising the Proposed Development ;
- section 3: Legislation, Policy and Guidance– provides an overview of legislation, NPS, development plan and National Grid Policies that are relevant to the design of the Proposed Development;
- section 4: Physical Context – provides a summary of area in which the Proposed Development is located and key features within this areas;
- section 5: National Grid's Design Principles and Approach to Routeing – summarises National Grid's Design Principles and the approach National Grid takes in the design of new electricity transmission infrastructure;
- section 6: Proposed Development - Design Evolution - summarises the evolution of the Proposed Development in line with the approach outlined in section 5;
- section 7: Design of the OHL – describes the pylon design and the synchronised/close parallel approach taken to the design of the OHL;
- section 8: Design of the THH/CSECs – describes the THH/CSECs summarising how the design and location have been informed by the Design Principles;
- section 9: Design of the Substation Modifications at Wylfa and Pentir – describes the substation extensions, summarising the design and access arrangements; and
- section 10: Conclusion – demonstrates how the Proposed Development has sought to achieve a high standard of design, satisfying the requirements of the NPS in terms of good design and operational and technical requirements.

2 Overview of the Proposed Development

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 (400 kV) and 275,000 volts (275 kV), 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 (DNOs) who operate at a maximum of 132,000 volts (132 kV). National Grid has duties placed upon it by the Electricity Act 1989 (Ref 7) (the Electricity Act) and operates under the terms of its transmission licence.

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

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

2.1.3 Section 38 and Schedule 9 of the Electricity Act also require 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.'

2.1.4 In its Stakeholder Community and Amenity Policy (Ref 8), National Grid sets out how the company will meet the duty placed upon it by the Electricity Act. The Stakeholder, Community and Amenity Policy also commits to the application of best practice methods, to assess the environmental impacts of proposals, identify appropriate mitigation measures, and to promoting effective stakeholder and community engagement.

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 person applies for a connection, National Grid

must offer to enter into an agreement(s) (Ref 9) to connect, or to modify an existing connection, to the transmission system and the offer shall make detailed provision regarding:

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

2.1.6 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 licensee's transmission system....In accordance with the National Electricity Transmission System Security and Quality of Supply Standard Version 2.1' (Ref 10).

2.1.7 The National Electricity Transmission System Security and Quality of Supply Standard (NETS SQSS) is a document that sets out certain criteria with which National Grid must comply in planning, developing and operating the transmission system.

2.2 THE NEED FOR THE PROPOSED DEVELOPMENT

2.2.1 The UK is facing a major challenge to meet projected energy needs over the coming decades, whilst at the same time tackling climate change. A significant challenge for National Grid and the UK energy industry is to deliver low carbon energy in an affordable, secure and sustainable way.

2.2.2 The majority of electricity is currently generated by burning gas or coal or by the use of nuclear power stations or renewable generation such as solar and wind. However, there is potential for around 20 per cent of generating capacity to be removed from the electricity transmission network by 2020, as a proportion of existing power stations will close because they have reached the end of their operating lives, or are unable to meet the requirements of climate change legislation.

2.2.3 This means that a major investment in new electricity generation is needed to replace power stations due for closure and to meet future energy demand.

2.2.4 Under the Climate Change Act 2008 (Ref 11), the UK government is committed to reducing CO_2 emissions by at least 80% of 1990 levels by 2050.

2.2.5 The UK energy market therefore needs to supply electricity from renewable sources such as wind power, and also from nuclear power, to help tackle climate change and enable the country to meet its national and international obligations. The introduction of new wind and nuclear power generation over the next few years will require the reinforcement and extension of the existing electricity transmission system.

2.2.6 National Grid has a statutory duty to promote competition in the supply of electricity and is obliged to offer a connection to the system to anyone who applies for a connection. Horizon Nuclear Power (HNP) has applied to National Grid to connect their proposed new nuclear power station (2940 MW) at Wylfa on Anglesey (referred to hereafter as Wylfa Newydd Power Station) to the national transmission system. The proposed Wylfa Newydd Power Station would be within a site already identified for this type of development in the UK Government's NPS EN-6 'Nuclear Power Generation' (Ref 12).

2.2.7 National Grid owns and operates an existing substation at Wylfa, which the proposed Wylfa Newydd Power Station would connect to. This substation is connected to the main transmission system on the mainland in North Wales by a 400 kV overhead electricity line, connecting at the existing National Grid substation at Pentir, in Gwynedd.

2.2.8 In addition to the Wylfa Newydd Power Station, National Grid has signed connection agreements to connect a further five 'customers' with proposed generation projects in North Wales; a total of 5,419 MW. Further details are provided in the Need Case (**Document 7.1**).

2.2.9 National Grid assessed whether there was sufficient capacity available in the existing transmission system in North Wales to accommodate the changes to customer resulting from new customer connections. From the assessment, National Grid forecasted that without reinforcement, the transmission system would not be compliant with the NETS SQSS from 2026 onwards. To ensure compliance a second 400 kV connection is required between the Wylfa and Pentir Substations. Further details about the need for this second connection are set out in full in the North Wales Connection Project, Project Need Case (**Document 7.1**).

2.3 OUTLINE OF THE PROPOSED DEVELOPMENT

2.3.1 The Proposed Development is located in north-west Wales and crosses the administrative boundaries of the Isle of Anglesey County Council (IACC) and Gwynedd Council. The location of the Proposed Development is illustrated on Figure 1.

2.3.2 The Proposed Development is split into six sections for ease of reference. The sections are illustrated on Figure 1 and comprise:

- Section A Wylfa to Rhosgoch;
- Section B Rhosgoch to Llandyfrydog;
- Section C Llandyfrydog to B5110 north of Talwrn;
- Section D B5110 north of Talwrn to Ceint;
- Section E Ceint to the Afon Braint; and
- Section F Afon Braint to Pentir.

2.3.3 The Proposed Development would provide a new 400 kV connection between the existing substations at Wylfa and Pentir and includes the following principal components:

- extension to the existing substation at Wylfa;
- sections of new 400 kV OHL between Wylfa Substation and Braint THH/CSEC on Anglesey including modifications to parts of the existing 400 kV OHL between Wylfa Substation and Pentir Substation;
- Braint THH/CSEC on Anglesey;
- tunnel between Braint and Tŷ Fodol THHs;
- Tŷ Fodol THH/CSEC in Gwynedd;
- new section of 400 kV OHL between Tŷ Fodol THH/CSEC and Pentir Substation;
- extension to the existing substation at Pentir; and
- temporary construction compounds, access tracks, construction working areas, localised widening of the public highway and third party works required to construct the infrastructure listed above.

2.4 OVERHEAD LINE

2.4.1 The proposed 400 kV connection would be achieved through the construction of approximately 33 kilometres (km) of new 400 kV OHL between Wylfa Substation on the north coast of Anglesey and Braint THH/CSEC to the south-west of Llanfairpwll. The connection would then be placed in a tunnel for approximately 4 km to Tŷ Fodol THH/CSEC south of the A4087 in north-west

Gwynedd. There would then be a further approximate 1 km section of new 400 kV OHL from Tŷ Fodol THH/CSEC to Pentir Substation. Where practicable the route of the new 400 kV OHL closely parallels the existing 400 kV OHL to create a more coherent appearance and thereby reduce visual effects. The justification on the routeing of the Proposed Development is set out in the Design Report (**Document 7.17**).

2.4.2 In order to maintain the close parallel and to minimise environmental effects, some sections of the existing 400 kV OHL would need to be dismantled and re-built. Therefore, the Proposed Development also includes approximately 3 km of new parallel 400 kV OHL in two sections. Figure 1 illustrates the sections of new and existing 400 kV OHL.

Options

2.4.3 Two options are being applied for in relation to the 400 kV OHL on Anglesey. Option A would oversail a residential property at Talwrn (R4/01483) and Option B would avoid oversailing the same property, but would include an additional pylon (4AP065). Proposed pylons 4AP064 and 4AP066 are in different locations for Option A and Option B; all other proposed pylons are broadly contiguous for both options. Options A and B are illustrated on Figure 1.

2.4.4 National Grid would progress Option A if an agreement can be reached with the owners of the property Dolydd Newydd (Receptor ID: R4/01483). Option A would result in the property no longer being a residential property. If National Grid is unable to reach an appropriate agreement, the construction of the Proposed Development would go ahead using Option B.

Transposition Points

2.4.5 Transposition points are a reconfiguration of the existing 400 kV OHL to allow OHL routes to remain parallel without the need for a line ‘duck-under’ or crossing, in order to reduce environmental effects, particularly in regard to visual and landscape effects. Transposition points allow for the continuation of a route from a section of new pylons to a section of existing pylons, whilst the other route is in effect a continuation of a route from a section of existing pylons to a section of new pylons. Transpositions are achieved by removing a section of the existing line and connecting the two newly formed 'ends' to two sections of new line approaching from either side. The proposed development includes three areas of transposition with the existing 400 kV OHL; these are between Rhosgoch and Rhosybol, near Llandyfrydog, and close to Maenaddwyn. At these locations there would be two parallel sections of new 400 kV OHL as illustrated on Figure 1.

2.4.6 As a result of the transpositions both the new and the existing connection would contain sections of new 400 kV OHL and sections of existing 400 kV OHL. Figure 1 illustrates where the new and existing sections would be located.

Pylon Details

2.4.7 The proposed pylons are typical lattice pylons, with three arms on either side of a central pylon body, the longest arm being the middle of the three, but with a slightly different form to the existing line, as the arms taper from the pylon body along the bottom and the top down to the end of each arm and they are, overall, slightly lighter and slimmer in appearance. The standard height is 46 m with a 7.1 m x 7.1 m base dimension. The proposed pylons of this type average 49.6 m in height.

2.4.8 The western alignment is referred to as the 4AP and the eastern alignment is referred to as the 4ZA[2]. A summary of the OHL element of the Proposed Development is provided in Table 2.

Table 1: Summary of the OHL Element of the Proposed Development

	4AP	4ZA	Total
Number of New Pylons	Option A – 65 Option B – 66	35	Option A – 100 Option B – 101
Number of Retained Pylons	25 (two of which would be modified)	70 (three of which would be modified)	95
Number of Dismantled Pylons	N/A	10	10
Total Length of New OHL Build	Approximately 22.2 km	Approximately 12.2 km	Approximately 34.4 km
Length of Existing Retained OHL	8.53 km	23.1 km	31.63 km
Length of Existing Line to be Dismantled			Approximately 3.6 km

[2] The existing OHL is known as the 4ZA, however, this reference and subsequent references in this chapter unless specified refer to the 4ZA as proposed by the Proposed Development which includes sections of existing pylons and conductors and sections of new pylons and conductors.

2.4.9 The detailed design work undertaken to identify the 400 kV OHL design of the Proposed Development has set out to develop a synchronised design wherever practicable. Localised constraints to siting of individual pylons have precluded this where an unpaired or less synchronised design would be locally preferable based upon the nature of the receptors local to a given pylon. The Design Report (**Document 7.17**) provides an explanation as to the evolution of the design of the Proposed Development for which a development consent order is being sought.

2.5 TUNNEL

2.5.1 National Grid has committed to the use of underground cables through the Anglesey Area of Outstanding Natural Beauty (AONB), and across the Menai Strait, to avoid potential effects on the landscape of the AONB and to protect iconic views along the Menai Strait. For more details see the Menai Crossing Report (**Document 9.6**).

2.5.2 In order to place the connection underground in Section F the following permanent components are proposed:

- Braint THH/CSEC on Anglesey;
- tunnel containing the underground cables between Braint and Tŷ Fodol THHs; and
- Tŷ Fodol THH/CSEC in Gwynedd.

2.5.3 The tunnel would have an internal diameter of up to 4 m and would be approximately 4 km in length. An example alignment of the tunnel is illustrated on the Illustrative Tunnel Longitudinal Section, Design Plan DCO_DE/PS/07_01 Sheet 1 of 2 (**Document 4.13**) and an illustrative cross section on Design Plan DCO_DE/PS/07_02 Sheet 2 of 2 (**Document 4.13**).

2.5.4 The Proposed Development would include tunnel shafts at Braint of approximately 75 m in depth and at Tŷ Fodol approximately 95 m in depth. Both shafts would have an internal diameter of up to 15 m.

2.5.5 Single or twin service tunnels would be excavated in both shafts regardless of tunnelling method (see below) for shunting of spoil locomotives and general storage as required; these would be approximately 20 m in length. The base of each shaft would be grouted to prevent water seepage and a concrete base plug would be installed.

2.5.6 If a Tunnel Boring Machine (TBM) were used to construct the tunnel, a TBM launch chamber would need to be excavated at the base of the launch shaft

(drive); it would be around 6 m diameter and 120 m in length. A reception chamber would also be required, it would be around 5 m in length. The TBM would then be assembled and would be launched from one shaft (the drive shaft) and exit by the other (the reception shaft). Should the tunnel be constructed using drill and blast, multiple holes would be drilled in the rock of the progressive tunnel face, explosives would be set and then blasting would occur. Once the blasting had been carried out, blasted rock fragments would be transported out of the tunnel using a conveyor system or similar before further blasting could commence.

Tunnel Head Houses and Cable Sealing End Compounds

2.5.7 Where the connection transitions from an OHL to underground cable a CSEC is required to provide a point of connection.

2.5.8 THHs are required to provide maintenance access to the tunnel and tunnel shafts. They would contain ventilation equipment to regulate the temperature in the tunnel as well as pumping equipment to remove any water ingress from the tunnel.

2.5.9 To reduce environmental effects each CSEC has been sited adjacent to each of the associated THHs and are collectively referred to as THH/CSECs.

2.5.10 Braint THH/CSEC is centred on Grid Reference SH 517 710, is approximately 47,700 sq m (square metres) (79,000 sq m inclusive of the area within which the permanent access track would be located (the permanent access track would be approximately 4 m wide located within the wider swathe)) and Tŷ Fodol THH/CSEC is centred on Grid Reference SH 546 683, is approximately 34,200 sq m which is inclusive of the permanent access track.

2.6 SUBSTATIONS

2.6.1 In order to facilitate the new connection, work would be required to extend the existing Wylfa Substation and the existing Pentir Substation.

2.6.2 Wylfa Substation is located adjacent to the existing Wylfa Nuclear Power Station and is centred on Grid Reference SH 352 938. The local realignment of the existing compound fence line to accommodate the proposed works would extend the existing substation compound by approximately 508 sq m. Items of existing equipment would need to be removed and new equipment installed within the site boundary.

2.6.3 Pentir Substation is located in north-west Gwynedd and is centred on Grid Reference to SH 559 677. The substation would be extended to the north-west, south-east and to the north-east totalling an area of approximately

40,000 sq m, to accommodate the additional equipment required for the new connection.

2.7 UNDERGROUND CABLES

2.7.1 Cables would be laid in the tunnel which would enable the connection across the AONB and Menai Strait. The proposed cables to be used within the tunnel section would be likely to be a cross linked polyethylene (XLPE) single core cable.

2.8 ORDER LIMITS

2.8.1 The Order Limits delineate the extent of the 'authorised development' for which development consent is being sought; and are the full extent of area required to locate and construct the Proposed Development. The Order Limits are illustrated on Figure 1.

2.9 LIMITS OF DEVIATION AND DESIGN PARAMETERS

Overview

2.9.1 The permanent linear infrastructure elements of the Proposed Development would all be within the LOD that are shown on the Works Plans (**Document 4.4**). In respect of the OHL, LOD are applied horizontally (i.e. on the ground), and vertically (i.e. in relation to pylon height). The final alignment of the tunnel would be subject to below ground horizontal and vertical LOD.

2.9.2 For non-linear works parameters are applied, which set the maximum design envelope for the works. Both linear and non-linear flexible aspects of the Proposed Development are explained further in ES Chapter 6, EIA Methodology and Basis of Assessment (**Document 5.6**).

Vertical LOD Overhead Line

2.9.3 The proposed vertical LOD is designed to take account of two standard 3 m steel lattice pylon extensions; the vertical LOD is therefore +6 m. This height has been chosen as a vertical increase of 3 m would allow a 25 m increase of horizontal movement. Given the design objective to maintain a 25 m clearance distance from hedges, fences and roads, a total of 50 m of horizontal movement would be required to move a pylon from one field to the next, which equates to a 6 m vertical increase, albeit this is dependent on local topography. There is no restriction placed on a reduction in height, other than legally required clearance limits for the relevant rating of the line.

2.9.4 There is no standard limit placed on the maximum depth of below ground works. However the difference in the effects caused by such depth

differences, (largely dependent upon the type of foundation used) would be likely to be very small. A standard LOD below ground is not therefore proposed for the OHL.

Horizontal Limits of Deviation - Overhead Line

2.9.5 In most instances the horizontal LOD extends approximately 50 m from the centreline of the alignment shown in the Works Plans (**Document 4.4**), though they are narrower in places. The conductor spans (accounting for conductor swing) and/or associated equipment are designed not to oversail areas beyond the LOD boundary. Pylon base locations can be varied, but due to the foregoing restrictions might not be able to be moved to the maximum extent of the LOD. The potential for pylon movement is reduced in long spans with large conductor sags as the swing of the conductor can be up to 20-30 m in plan either side of the centreline. It is possible for individual spans to have smaller conductor swings, conversely allowing respective pylon bases to move further towards the edge of the LOD. In some locations the standard 50 m extent of the LOD from the centreline has been restricted, typically to avoid the potential for a pylon and/or conductors to be located in close proximity to a receptor. The LOD is shown on the Works Plans (**Document 4.4**).

2.9.6 It is currently anticipated that the final pylon locations will be those shown on the Works Plans (**Document 4.4**) and there are only a limited number of situations that could lead to use being made of the flexibility allowed for by the LOD. For the Proposed Development this is particularly important as synchronising the pylon locations has been an important design objective. Further information regarding the limitations on the use of flexibility is provided below.

Constraints

2.9.7 Although the horizontal LOD may appear to give a great deal of flexibility regarding the location of pylons, in reality such movement would be limited by a number of factors.

2.9.8 Firstly, the circumstances under which a pylon may need to be moved are likely to be limited to the following:

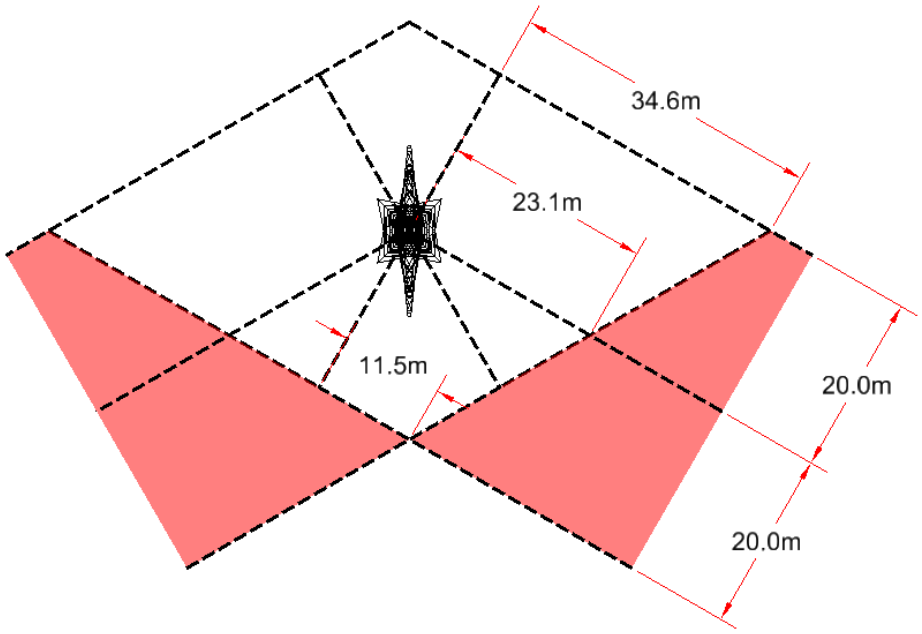
- unrecorded significant archaeology;
- new or increased ecological constraints
- unforeseen ground conditions; and
- landowner requests.

2.9.9 The ability to move pylon locations away from those identified on the Works Plans (**Document 4.4**) is effectively restricted by the vertical LOD (see section 2.9.3). Movement is restricted by the height of one or both pylons in a span. Moving a single pylon in isolation could result in that pylon needing to increase in height. This is due to the increase in span length of one of the adjacent spans and consequential lowering of the conductor (i.e. increased sag). Therefore to maintain the minimum statutory ground clearance the pylon height may need to be raised. The limit on moving a particular pylon is essentially how far a single pylon could move and still maintain the required conductor ground clearance while not exceeding the vertical LOD (+6 m). Many things can influence this, including the topography of the land and the type and location of obstacles in the span; however as indicated above the maximum 6 m vertical increase in the height of a pylon would equate to approximately 50 m of horizontal pylon movement.

2.9.10 Should any pylon be repositioned along the length of the OHL, the subsequent effects on the position of the next pylons along the alignment (i.e. any subsequent repositioning of other pylons) would be relatively limited, as National Grid would typically seek to retain pylon positions at the locations shown on the Works Plans (**Document 4.4**).

2.9.11 Pylons are either suspension pylons, from which the conductor is simply suspended, or tension pylons, which are more robust structures that hold conductors in tension where there is a need for the route of the OHL to change direction, or to maintain tension in long straight sections. A tension pylon would, in practice, have very limited ability to be moved from its proposed position. It could only follow one of the route directions before or after the pylon and as such the opposite section would need to deviate widthways for which the tolerance is more restricted, i.e. the conductors (and the space required for swing in adverse weather conditions) would soon exceed the horizontal LOD. This is illustrated on the Image 1 below, where the white kite shape shows the maximum horizontal deviation possible for a typical tension tower (NB the pylon could not be positioned in the area shaded in red; the kite shape and dimensions would vary with change in angle of deviation).

Image 1: Representative Extent of Generic Horizontal LOD at 60° Angle Position Based on an Indicative 20 m Movement.



2.9.12 The design shown on the Works Plans (**Document 4.4**) has been developed as an efficient solution for the Proposed Development. It is likely that substantial changes to the design as presented, would decrease the efficiency of the Proposed Development design. As such there is currently an expectation that the design shown as an OHL centre line on the Works Plans (**Document 4.4**) would be constructed, unless there were good engineering, safety or environmental reasons not to do so.

2.9.13 Limitations have been placed on the horizontal LOD where particular environmental sensitivities have been identified. Each request to constrain the horizontal LOD has been considered by the design team to ensure that the loss of flexibility does not present a risk to the buildability of the Proposed Development. These restrictions have been secured through the Schedule of Environmental Commitments (**Document 7.4.2.1**), which is part of the CEMP (**Document 7.4**) which is secured under Requirement 5. These include the location of a number of pylons that have largely been fixed to limit the visual effects in more sensitive locations.

Substations

2.9.14 There is no flexibility in the location of the Wylfa Substation, as works would be limited to the local realignment of the existing compound fence line. Maximum parameters have been set for the extent of the works at the Wylfa

Substation, and these are shown on the Wylfa Substation Parameter Plan DCO_DE/PS/01_01 Sheet 1 of 10 (**Document 4.13**).

2.9.15 There is little flexibility in the area available for the extensions to Pentir Substation. The maximum parameters for the permanent works to the Pentir Substation are shown on the Pentir Substation Parameter Plan DCO_DE/PS/01 Sheet 3 of 9 (**Document 4.13**).

Tunnel Head Houses/Cable Sealing End and Tunnel Construction Compounds

2.9.16 There is limited flexibility in the location of THH/CSECs, as they must be located within the locations shown on the Works Plans (**Document 4.4**) and within the maximum design parameters shown on the Design Plans: Braint THH/CSEC Parameter Plan DCO_DE/PS/09_01 Sheet 1 of 8 and Tŷ Fodol THH/CSEC Parameter Plan DCO_DE/PS/09_05 Sheet 5 of 8 (**Document 4.13**).

Tunnel

Tunnel Shafts

2.9.17 The tunnel shaft at Braint would be approximately 75 m deep and Tŷ Fodol 95 m deep. Although no maximum depth or width parameter is set, it is currently considered unlikely that shafts of a substantially greater depth would be used, as shafts of a greater depth than necessary would add engineering operational complexity and cost. Both shafts would have an internal diameter of up to 15 m.

Horizontal LOD Tunnel

2.9.18 There is a below-ground Horizontal LOD for the tunnel, which is shown on the Works Plans (**Document 4.4**). The Design Plan DCO_DE/PS/07_01 Sheet 1 of 2 (**Document 4.13**) shows an example tunnel alignment within the LOD, which is the longest tunnel alignment within the below-ground Horizontal LOD.

Vertical LOD Tunnel

2.9.19 There is a minimum LOD set for the tunnel depth, which is a minimum of 10 m below the top of the bedrock. There is no maximum depth set but would be limited by the need for safety and engineering efficiency.

3 Legislation, Policy and Guidance Context

3.1 INTRODUCTION

3.1.1 The Planning Statement (**Document 7.14**) submitted with the Application sets out a comprehensive review of relevant national and local planning policy. The text below provides a summary of the relevant legislation and policy that the Proposed Development has been developed in accordance with.

3.2 THE LEGISLATIVE AND POLICY CONTEXT

UK Low Carbon Transition Plan

3.2.1 The UK Low Carbon Transition Plan (Ref 13) details the actions to be taken to cut carbon emissions by 34% by 2020 (based on 1990 levels) and includes proposals for transforming the power sector. Within this National Strategy, the Government has pledged to secure energy supplies by ensuring a supportive climate for the substantial new investment needed to bring forward low carbon infrastructure. It also endorsed industry plans to increase grid capacity and to speed up connection of renewable electricity to the grid and the development of new technologies that could enable the grid to work better in the future (Ref 14).

Energy and Climate Change Policy

3.2.2 As part of the Government's review of the UK's energy supply, a series of consultation documents and subsequent White Papers have been published, relating to the UK's energy goals and the strategy for meeting them.

3.2.3 The 2007 White Paper: 'Meeting the Energy Challenge' (the '2007 White Paper') (Ref 15) sets out the Government's international and domestic energy strategy to address the key long term energy challenges faced by the UK. The strategy is based around the need to:

a) save energy;

b) develop cleaner energy supplies; and

c) secure reliable energy supplies at prices set in competitive markets.

3.2.4 A need for investment in the transmission and distribution networks was noted in the 2007 White Paper. Paragraph 5.29 of the 2007 White Paper states:

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

Planning Act 2008

3.2.5 The Planning Act 2008 (Ref 16) introduced a new planning regime for Nationally Significant Infrastructure Projects (NSIPs) in England and Wales. The objective of the new regime was to improve the process for delivering major infrastructure projects by making the process more certain.

3.2.6 The Planning Act 2008 makes provision for the Government to produce National Policy Statements (NPSs) setting out the national policy for NSIPs. The NPSs set out the strategic policy framework against which individual proposals would be assessed prior to a recommendation being made to the Secretary of State. There are two NPSs relevant to the North Wales Connection Project:

- Overarching NPS for Energy (EN-1) (Ref 1); and
- NPS for Electricity Networks Infrastructure (EN-5) (Ref 3).

3.2.7 NPSs are of primary importance to the decision-making process when DCO applications are under consideration. Section 104 of the Planning Act 2008 (as amended) states:

'(2) In deciding the application the Secretary of State must have regard to:

(a) any national policy statement which has effect in relation to development of the description to which the application relates (a 'relevant national policy statement')...

(3) The Secretary of State must decide the application in accordance with any relevant national policy statement, except to the extent that one or more of subsections (4) to (8) applies.'

Electricity Act

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

- to develop and maintain an efficient, co-ordinated and economical system of electricity transmission; and

- to facilitate competition in the supply and generation of electricity.

3.2.9 Section 38 and Schedule 9 of the Electricity Act also require 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.'

National Parks and Access to the Countryside Act and the Countryside and Rights of Way Act 2000

3.2.10 As a statutory undertaker, National Grid also has other duties relating to amenity and environmental considerations. In relation to designated landscapes, the National Parks and Access to the Countryside Act 1949 and the Countryside and Rights of Way Act 2000 require all statutory undertakers to have regard to the purposes of National Parks and AONBs respectively when carrying out their statutory duties. Government guidance acknowledges that *'the [statutory] duties do not override particular obligations or considerations which have to be taken into account by relevant authorities in carrying out any function.'* The guidance goes on to explain that the purposes of designating nationally protected landscapes need to be *'recognised as an essential consideration in reaching decisions or undertaking activities that impact on those areas.'*

3.2.11 These statutory duties have been considered as part of the overall design process, from the outset of the project to the development of the design which is the subject of the DCO application (the Proposed Development).

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

3.2.12 The Overarching NPS for Energy (EN-1) notes that it is critical that the UK continues to have secure and reliable supplies of electricity as it makes the transition to a low carbon economy. This means ensuring that:

- there is sufficient capacity (including a greater proportion of low carbon generation) to meet demand at all times, including a safety margin of spare capacity to accommodate fluctuations in supply or demand;

- this capacity is reliable enough to meet demand as it arises;

- there is a diverse mix of technologies and fuels (including primary fuels imported from a wide range of countries); and
- there are effective price signals, so that the market can react in a timely way to minimise imbalances between supply and demand.

3.2.13 The Government's objectives for energy and climate change will require further diversification of the UK's energy sources and much greater use of renewable and other low carbon forms of generation.

3.2.14 Part 4 of EN-1 sets out certain general policies, against which applications relating to energy infrastructure are to be decided, that *'do not relate only to the need for new energy infrastructure'* (covered in Part 3 of EN-1) or *'to particular physical impacts of its construction or operation'* (covered in Part 5 of EN-1 and the technology- specific NPSs; in this case EN-5). The following sections are relevant to the design of the Proposed Development:

- Environmental statement;
- Habitats and species assessment;
- Consideration of alternatives;
- Good design for energy infrastructure;
- Climate change adaptation;
- Pollution control and other regulatory regimes;
- Safety;
- Health; and
- National security.

3.2.15 The provision of information by the applicant in accordance with these policies (together with those in Parts 3 and 5 and, in this case EN-5) enables the decision making authority to:

'take into account environmental, social and economic benefits and adverse impacts, at national, regional and local levels.'

3.2.16 Of particular relevance to this DAS is Part 4.5 of EN-1 Criteria for 'good design' for energy infrastructure. Part 4.5.1 of EN-1 explains that '*The visual appearance of a building is sometimes considered to be the most important factor in good design*' but that '*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.' Whilst it notes 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*' it also 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.*'

3.2.17 Paragraph 4.5.2 recognises the importance of good design in addressing potential environmental effects, stating that 'Good design is also a means by which many policy objectives in the NPS can be met, for example the impact sections show how good design, in terms of siting and use of appropriate technologies can help mitigate adverse impacts such as noise'.

3.2.18 Paragraph 4.5.3 goes on to explain that,

3.2.19 *'in light of the above, and 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 be satisfied 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'*.

3.2.20 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, responding to local constraints or concerns in order to reduce adverse effects associated with the Proposed Development. The concept of good design has therefore not only informed the selection of technologies, route of the OHL and location of the THH/CSECs but also those embedded mitigation measures which would minimise adverse effects both during the construction and operation of the Proposed Development.

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

3.2.21 EN-5 states that the Government's objective of moving electricity generating infrastructure in the UK towards a low carbon economy, while maintaining security of supply, will be heavily dependent on the availability of an electricity transmission network which is fit for purpose and robust. That network will need to be able to support a more complex system of supply and demand and cope with generation occurring in a wider range of locations. It indicates that the Examining Authority should start its assessment of applications for infrastructure covered by the NPS EN-5 on the basis that need has been demonstrated.

3.2.22 Paragraph 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 OHLs, particularly with regard to:

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

3.2.23 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).

3.2.24 Part 2 of EN-5 sets out the basis for assessing proposals. For a variety of topic areas (including many of those normally covered by EIA, and which are reported in the accompanying ES (**Volume 5**)) it advises 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.

3.2.25 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 OHLs 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, 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 OHL 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.'

3.2.26 Resilience to climate change is highlighted as a main issue (section 2.4) and NPS EN-5 advises that applicants should in particular set out how the proposal would be resilient to:

- flooding, particularly for substations that are vital for the electricity transmission and distribution network;
- effects of wind and storms on OHLs;
- higher average temperatures leading to increased transmission losses; and
- earth movement or subsidence caused by flooding and drought for underground cables.

3.2.27 Paragraph 2.8.5 of EN-5 supports the continued application of the Holford Rules, which are described below in paragraph 3.2.36 and section 5.3 to guide the selection of routes for OHLs. It states that the Examining Authority should expect the applicant to have followed these Rules where possible in its OHL 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.

3.2.28 In discussing the undergrounding of OHLs in paragraph 2.8.8, EN-5 states that:

'where there are serious concerns about the potential landscape and visual effects of a proposed OHL [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).'

3.2.29 It also states in paragraph 2.8.9 that the Secretary of State should:

'only refuse consent for OHL proposals in favour of an underground or sub-sea line if it is satisfied that the benefits of the non-OHL alternative clearly outweigh any extra economic, social and environmental costs and those technical difficulties are surmountable. Undergrounding of a line solely to further reduce the level of EMF exposure is unlikely to be justified.'

3.2.30 In respect of noise from OHLs, NPS EN-5 notes in paragraph 2.9.11 that this is unlikely to lead to the Secretary of State refusing an application but it may be necessary to consider the use of appropriate requirements to ensure noise is minimised as far as possible.

3.2.31 NPS EN-5 states in paragraph 2.10.9 that the International Commission on Non-Ionising Radiation Protection (ICNIRP) has developed health protection guidelines for both public and occupational exposure. Applications for new 400 kV OHLs or underground cables need to satisfy the Planning Inspectorate that the ICNIRP basic restrictions for public exposure would not be reached or exceeded for any residential accommodation along the route of the OHL. It is therefore considered that EMF would not influence corridor selection, but may influence the detailed connection design.

3.2.32 These matters have been considered by National Grid as part of the overall design process, from the outset of the project to the development of the design which is the subject of the DCO application (the Proposed Development).

Planning Policy Wales

3.2.33 Planning Policy Wales (PPW) (Edition 9) (Ref 17); sets out the land use planning policies of the Welsh Government and should be taken into account by local planning authorities in the preparation of development plans. It is supplemented by a series of Technical Advise Notes (TANs), which, with PPW, circulars and policy clarification letters, comprise national planning policy and Government planning advice in Wales.

3.2.34 PPW section 12.8.6 notes that Welsh Government's aim is to secure an appropriate mix of energy provision for Wales, whilst minimising potential environmental and social impacts. PPW states:

'An integrated approach should be adopted towards planning renewable and low carbon energy developments and additional electricity grid network infrastructure.'

3.2.35 Edition 10 of PPW was published for consultation on 12 February 2018.

Local Plan Policies

3.2.36 The Joint Local Development Plan (JLDP) for Anglesey and Gwynedd was adopted in July 2017 (Ref 18) and is the planning policy document for Anglesey and Gwynedd (excluding that area within the Snowdonia National Park Planning Authority). It contains the key policies and land use allocations that will facilitate the Plan area's development up to 2026.

3.2.37 As set out in NPS EN-1 (para 4.1.5), Local Development Plans are one of the matters which the decision-maker may consider to be important and relevant.

3.2.38 Within the JLDP, Strategic Objective 7 states:

'Ensure that all new development meets high standards in terms of quality of design, energy efficiency, safety, security (persons and property) and accessibility, relates well to existing development, enhances public realm and develops locally distinctive quality places.'

3.2.39 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 objectives for the Proposed Development.

3.2.40 The compliance of the Proposed Development as a whole with relevant planning policy is considered in the Planning Statement (**Document 7.14**).

National Grid Policies

3.2.41 National Grid's Stakeholder, Community and Amenity Policy includes ten commitments linked to its environmental obligations under Schedule 9 of the Electricity Act. These include:

- only seeking to build new OHLs and substations where the existing transmission infrastructure cannot be upgraded to meet transmission security standards;
- seeking to avoid nationally and internationally designated areas where new infrastructure is required; and

- minimising the effects of new infrastructure on other sites valued for their amenity.

3.2.42 The Stakeholder, Community and Amenity Policy also commits to applying best practice methods, assessing the environmental impacts of proposals and identifying appropriate mitigation measures, and to promoting effective stakeholder and community engagement.

3.2.43 In August 2012, National Grid published Our Approach to the Design and Routeing of New Electricity Transmission Lines (Ref 19). This states that

'whether the preferred route corridor is predominately overhead, underground or sub-sea, detailed survey and assessment work is carried out to find the alignment of the transmission line which best satisfies all of our obligations and the needs of stakeholders. In doing this we seek to avoid as far as possible any impacts on people, settlements, and environmentally sensitive areas. We continue to refine the route alignment to minimise any visual and other environmental impacts, in consultation with stakeholders and communities.'

3.2.44 Our Approach to the Design and Routeing of New Electricity Transmission Lines (Ref 19) sets out that National Grid considers the relative merits of using an underground cable rather than an OHL on a case by case basis. The excessive cost of high voltage underground transmission coupled with the environmental and operational disadvantages are important reasons for the limited use of underground cables at 400 kV.

3.2.45 National Grid considers proposals for undergrounding for those places where the benefits of maintaining visual amenity can be demonstrated to:

- outweigh the adverse effects upon other environmental factors;
- justify the high additional cost; and
- where it is technically possible and would not conflict with National Grid's statutory duties.

3.2.46 When planning the routeing for transmission connections in exceptionally constrained areas, consideration may be given to the use of underground cables. Exceptionally constrained areas include:

- urban areas where due to the density of residential, community and associated development and public open space, a reasonable direct overhead route is impracticable;

- rural areas where landscape features are protected at an international or national level e.g. National Parks, World Heritage Sites and Areas of Outstanding Natural Beauty; and

- estuary and major river crossings – where there is an exceptionally difficult and costly OHL solution which would be comparable with or exceed the cost of an underground cable.

Holford Rules

3.2.47 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' (Ref 20), were reviewed by National Grid in 1992 and have become accepted within the electricity transmission industry as the basis for overhead transmission line routeing.

3.2.48 In overview, the Holford Rules seek to minimise any adverse impacts associated with new OHLs through the adoption of a series of 'common sense' rules. The seven rules and supplementary notes, which are reported in section 5.3 of the DAS, seek to inform the design of OHLs by, for example, guiding them away from areas that 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).

3.2.49 The Holford Rules were a consideration for National Grid throughout design of the Proposed Development.

National Grid's Guidelines on the Design and Siting of Substations (The Horlock Rules)

3.2.50 National Grid's guidelines (often referred as 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. The guidelines are set out in section 5.4 of this report. In summary, like the Holford Rules, they facilitate consideration of environmental and amenity matters within the design and siting of new substation infrastructure.

3.2.51 Although no new substations are being proposed these rules have been referred to in determining the preferred locations for the THH/CSECs.

3.3 DESIGN AND ACCESS STATEMENT GUIDANCE

3.3.1 This DAS has been prepared having regard to TAN 12 Design (Ref 4) and Design and Access Statements in Wales (Ref 5).

3.3.2 Design and Access Statements in Wales (Ref 5) is a guidance document that sets out the requirements for a DAS and provides guidance on what to include in a DAS. It states that the DAS should explain the design principles and concepts that have been applied to the development and how issues relating to access have been dealt with.

3.3.3 Although the content required within a DAS, as set out in Design and Access Statements in Wales (Ref 5), is included in this document, the structure is different, and this reflects both the unique nature of linear energy infrastructure, and precedents set by the equivalent documents submitted for other National Grid projects consented under the Planning Act 2008.

4 Physical Context

4.1.1 This section summarises the environmental characteristics of the Proposed Development, encompassing the environmental, transport and socio-economic baseline, which has strongly influenced the Proposed Development as applied for.

4.1.2 The Proposed Development is in north-west Wales and crosses the administrative boundaries of Isle of Anglesey Country Council and Gwynedd Council.

4.2 SUMMARY OF ENVIRONMENTAL CHARACTERISTICS

4.2.1 The land is predominately rural, with much of the land in agricultural use. Built development is dispersed consisting predominately of small settlements and isolated dwellings located within or adjacent to the Proposed Development area. The larger settlements are located towards the south of Anglesey and include Llangefni to the west of the Proposed Development and Llanfairpwll to the east. In Gwynedd, Caernarfon is to the south-west and Bangor is to the north-east of the Proposed Development.

4.2.2 The landform of Anglesey typically falls from north-east to south-west, with ridgelines generally following the same pattern. There are two large water supply reservoirs; Llyn Alaw to the north of the island, located approximately 550 m from the Proposed Development and Cefni Reservoir in the centre, located approximately 2.25 km from the Proposed Development. The island is separated from the Welsh mainland by the Menai Strait, which is a narrow stretch of tidal water approximately 25 km long and 250 m wide at the narrowest point.

4.2.3 A large proportion of Anglesey's rural coastline has been designated as an Area of Outstanding Natural Beauty (AONB).

4.2.4 The landform of Gwynedd generally falls from the Snowdonia mountain range to the coast and estuaries of the north and west. The rolling landform transitions from the Menai Strait to the upland fridges of Snowdonia where the Pentir Substation is located.

4.2.5 The A55 is the primary route which links Holyhead to the coastal towns along the North Wales Coast. The A55 is crossed by the Proposed Development

to the west of Llanfairpwll. Other main roads include the A5, A5025, A4080, A4087, A487 and the A4244.

4.2.6 Environmental designations are illustrated on the Other Environmental Features Plans (**Document 4.6**), Statutory or Non-Statutory Sites or Features of Nature Conservation, Habitats and Water Bodies Plans (**Document 4.7**) and Statutory or Non-Statutory Sites or Features of the Historic Environment Plans (**Document 4.10**).

4.2.7 The indicative design of the Proposed Development, as shown on the Works Plans (**Document 4.4**) is based on environmental, technical and economic factors, as well as a consideration of consultation responses and feedback.

4.2.8 Section 7 of each of the technical chapters (**Documents 5.7 to 5.18**) provides full details of the baseline environment within which the Proposed Development would be constructed, operated, maintained and eventually decommissioned.

5 National Grid's Design Principles and Approach to Routeing

5.1 INTRODUCTION TO NATIONAL GRID'S OVERARCHING DESIGN PRINCIPLES

5.1.1 National Grid has sought to develop a well-designed scheme that provides an efficient connection while also responding to environmental constraints and comments from stakeholders and the public where practical. National Grid's has sought to ensure that the Proposed Development is designed to mitigate any potential adverse impacts as far as reasonably possible.

5.1.2 The design evolution for the Proposed Development has been an iterative process. National Grid has looked at ways to achieve good design through the careful consideration of route corridors that have been subject to consultation and the application of design principles. National Grid has also investigated alternatives from suggestions made during consultation, all of which are reported in the Consultation Report (**Volume 6**). Section 6 of this DAS describes the design approach adopted by National Grid from inception through to the Proposed Development, which is the subject of the draft DCO (**Document 2.1**). The DAS explains why particular options for the THH/CSECs 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.

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

5.2 DESIGN PRINCIPLES

5.2.1 The scale of any National Grid infrastructure proposal is largely determined by its function, operational requirements and adherence to related duties under the Electricity Act 1989.

5.2.2 As discussed in section 2.1.2 to 2.1.4 the Electricity Act confers a duty upon National Grid, under Section 38 and Schedule 9, to ensure that it has regard to amenity when carrying out its undertakings.

5.2.3 It is these responsibilities and objectives that underpin National Grid's design principles upon which the Proposed Development is based.

5.3 HOLFORD RULES

5.3.1 National Grid employs the Holford Rules to inform the design and routeing of OHLs. 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.

5.3.2 The Holford Rules are as follows:

- 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. When a line has to cross a ridge, secure this opaque background as long as possible, 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 - were country 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.

5.3.3 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.

5.3.4 The Holford Rules were adopted by National Grid to inform the route corridor and detailed alignment studies which National Grid has undertaken to inform the Proposed Development.

5.4 NATIONAL GRID'S SUBSTATIONS AND THE ENVIRONMENT: GUIDANCE ON SITING AND DESIGN

5.4.1 These are internal National Grid guidelines for the sensitive siting and design of permanent facilities, such as substations, so as to reduce or avoid the environmental effects of such developments. The guidelines (often referred as the Horlock Rules) state that:

- Guideline 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;

- Guideline 2 - the siting of new National Grid substations, sealing end compounds and line entries should as far as reasonably practicable seek to avoid altogether internationally and nationally designated areas of the highest amenity, cultural or scientific value by the overall planning of the system connections;

- Guideline 3 - areas of local amenity value, important existing habitats and landscape features including ancient woodland, historic hedgerows, surface and ground water sources and nature conservation areas should be protected as far as reasonably practicable;

- Guideline 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;

- Guideline 5 - the proposals should keep the visual, noise and other environmental effects to a reasonably practicable minimum;
- Guideline 6 - the land use effects of the proposal should be considered when planning the siting of substations or extensions;
- Guideline 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;
- Guideline 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;
- Guideline 9 - the design of access road, perimeter fencing, earthshaping, planting and ancillary development should form an integral part of the site layout and design to fit in with the surroundings;
- Guideline 10 - in open landscape especially, high voltage line entries should be kept, as far as possible, visually separate from low voltage lines and other OHLs so as to avoid a confusing appearance;
- Guideline 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.

5.4.2 Whilst the Proposed Development does not include a new substation (there is a proposed substation extension at Pentir and works at Wylfa Substation), the principles contained in these guidelines were applied to the siting of the Braint and Tŷ Fodol THH/CSECs.

5.5 APPROACH TO DESIGN AND ROUTEING

5.5.1 In August 2012, National Grid published 'Our Approach to the Design and Routeing of New Electricity Transmission Lines' (Ref 19) which states:

'Whether the preferred route corridor is predominately overhead, underground or sub-sea, detailed survey and assessment work is carried out to find the alignment of the transmission line which best satisfies all of our

obligations and the needs of stakeholders. In doing this we seek to avoid as far as possible any impacts on people, settlements, and environmentally sensitive areas. We continue to refine the route alignment to minimise any visual and other environmental impacts, in consultation with stakeholders and communities.'

5.5.2 The approach to the routeing of new electricity transmission lines is summarised in Image 2 and is used as guidance for all of National Grid's project teams and also provided to stakeholders to provide a transparent and clear understanding of how National Grid designs its transmission lines to meet its statutory obligations.

Image 2: National Grid Design and Routeing Process

5.5.3 The design and routeing of new transmission lines is informed by feedback from consultation as well as experience from other major transmission infrastructure projects. The approach complies with the requirements of the Electricity Act 1989 and National Policy Statements EN-1 and EN-5 as well as the principles of the Holford Rules which provide guidance on the routeing of OHLs.

Stage 01 - Strategic Options

5.5.4 In responding to a request for a connection and preparing a need case for a new electricity transmission line, National Grid seeks to:

- determine whether the existing network can accommodate the customer or capacity needs economically and efficiently before considering new build solutions;
- consider alternatives to meet the need e.g. adjusting arrangements with the generator or considering different approaches to operating the network; or
- consider investing in new equipment to optimise the use of the existing network.

5.5.5 Where new infrastructure is required, National Grid considers the ways in which this could be achieved, this approach might include:

- different technologies such as underground cables, gas-insulated lines, OHLs or sub-sea High Voltage Direct Current (HVDC) cables;
- different geographical connection points; or
- a combination of the two.

5.5.6 All strategic options are subject to a technical compliance filter to ensure that the options would work on the network and address the technical need identified. This process takes place prior to options being presented to stakeholders. Options are then subject to appraisal to analyse their relative costs, effects and benefits. As part of this process, National Grid considers environmental, socio-economic and technical issues alongside a capital and lifetime cost for each strategic option. This appraisal is informed by feedback from Stage 1 consultation and subsequent back-check exercises.

5.5.7 Following this options appraisal work, a preferred option or options are taken forward for further assessment and design work. This may involve a choice of technology or the identification of connection points, with further development of the technology at Stage 02. Where a predominately overhead route is preferred, there is a continuing process of appraisal and consultation throughout Stages 02 and 03 which considers ways to mitigate the impact of a proposed route. At this stage, National Grid may also look for opportunities to remove existing infrastructure to minimise the overall 'wirescape'.

5.5.8 The guidance identifies that National Grid may promote a sub-sea or predominately underground strategic option where there are very significant constraints relating to landscape or visual issues which would conflict with National Planning Policy. Such constraints might include: locations with physical difficulties in constructing an OHL (such as in urban areas or mountains) or the presence of highly valued landscapes such as National Parks or AONB's.

Undergrounding

5.5.9 As discussed in paragraphs 3.2.41-3.2.44, National Grid considers using underground cables for amenity reasons instead of OHLs on individual merits. 'Our Approach to the Design and Routeing of New Electricity Transmission Lines' (Ref 19) sets out the categories of area which National Grid believes are the highest priority and where consideration may be given to undergrounding. They indicate those exceptional circumstances where National Grid believes undergrounding might be justified.

5.5.10 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 OHLs and therefore where consideration of underground cables is warranted. In such areas, judgement on the merits of each case would be required to justify the use of underground cables.

5.5.11 The nature of the exceptionally constrained areas varies in urban, rural and estuary crossing areas and the factors outlined below are a basis for the consideration of the potential use of underground cables. Please note this is not an exhaustive list and all projects will be considered on a case-by-case basis:

- 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 impracticable;

- 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, AONBs 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 protected 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; and

- exceptionally constrained estuary and major river crossings: Where there may by physical difficulties in constructing an OHL or were the cost of an OHL would be comparable with or exceed those of an underground cable.

5.5.12 As noted above 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 OHLs 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 the cables e.g. tree and hedge removal, or the impacts of additional CSECs, terminal towers and ancillary equipment.

Stage 02 Outline Routeing and Siting

5.5.13 At Stage 02, routeing studies are carried out to identify broad potential corridors for the new transmission route for the strategic option(s) that National Grid are considering. Siting studies are also carried out to identify suitable locations for required infrastructure, such as construction compounds and operational compounds.

5.5.14 When routeing OHLs, National Grid apply the Holford Rules (described in section 5.3 above) and consider the types of mitigation that could offset any landscape or visual effects.

5.5.15 Where the use of underground cables is proposed, this would necessitate the construction of CSECs to enable the transition from underground cable to OHL and vice versa). The siting of CSEC infrastructure also requires careful consideration in accordance with the substation siting guidelines (described in section 5.4 above).

5.5.16 Route corridor options are then subject to consultation with National Grid's core stakeholders, followed by an options appraisal. This options appraisal is used to determine the environmental, socio-economic, technical and cost implications that would be associated with different route options.

5.5.17 At this stage, public consultation is undertaken in order to seek views both on the preferred strategic option and the potential route corridors. National Grid produces a feedback report which identifies all of the comments received and how they have been taken into account. The results of the consultations together with all of the studies carried out are used to identify the preferred route corridor (or corridors).

Stage 03 Detailed Routeing and Siting

5.5.18 There is a continuing process of appraisal and consultation throughout Stage 03. This additional appraisal work involves detailed design, survey and assessment work to determine the alignment of the transmission line that would best satisfy National Grid's obligations and the needs of stakeholders. In undertaking this, National Grid seeks to avoid, as far as possible, any significant impacts on people, settlements, and environmentally sensitive areas.

5.5.19 National Grid continues to apply the Holford Rules (where appropriate) and engage with stakeholders, thematic groups and communities during the development of the detailed alignment.

Stage 04 The Proposed Application

5.5.20 Public consultation on the proposed application is carried out in accordance with Sections 42, 47 and 48 of the Planning Act 2008. At the close of the consultation period, National Grid review the proposals and make any necessary amendments in light of consultation responses received.

Stage 05 Application for Development Consent

5.5.21 Once the outcomes of the consultation have been assessed and any appropriate amendments are made to the proposals, an application for development consent will be submitted to the Planning Inspectorate.

Summary

5.5.22 The approach outlined above has been adopted by National Grid to inform the routeing and site selection of the Proposed Development in an iterative manner which has considered the physical context and features along the route corridors and responded to stakeholder feedback where appropriate.

6 Design Evolution of the Proposed Development

6.1 INTRODUCTION

6.1.1 The majority of the Proposed Development would be located above ground. The design objective was therefore to ensure that this infrastructure was integrated successfully into its surroundings using the Holford Rules, Guidelines on the Design and Siting of Substations and 'Our Approach to the Design and Routeing of New Electricity Transmission Lines' as a basis to inform the design and to ensure that the Proposed Development is in accordance with the NPS and National Grid's duties under the Electricity Act.

6.1.2 The design of the Proposed Development has been an iterative process, influenced where appropriate by an extensive process of stakeholder engagement. This section summarises the evolution of the Proposed Development. More information on the evolution of the Proposed Development and the outcomes of the various routeing reports can be found in the Design Report (**Document 7.17**).

6.2 PROJECT DEVELOPMENT PROCESS

6.2.1 The background to the project and consideration of alternatives is described in detail within the Design Report (**Document 7.17**).

6.2.2 The design evolution of the Proposed Development has been guided by the following steps:

- need case: to confirm the need to develop the high voltage transmission system to provide a secure connection for the Wylfa Newydd Power Station;
- strategic optioneering: to develop and assess strategic options that would meet the identified need, including assessment of alternative technologies and selection of an option to take forward;
- route corridor study: to take account of environmental constraints and define potential areas of land or 'route corridors' for the new OHL and identify the most appropriate option to meet the need;

- initial consultation stages: to obtain the views of statutory bodies, other agencies and the general public on the strategic options, the preferred strategic connection option and route corridor options;

- route corridor selection: to consider which of the possible route corridors is preferred and announce the preferred corridor;

- consultation: to obtain the views of statutory bodies, other agencies and the general public on the route options within the preferred route corridor and upon search areas for operational compounds; draft route: to develop the connection detail within the preferred route corridor and to consult on this;

- EIA Scoping Report: to outline the approach and scope of the EIA for the Proposed Development;

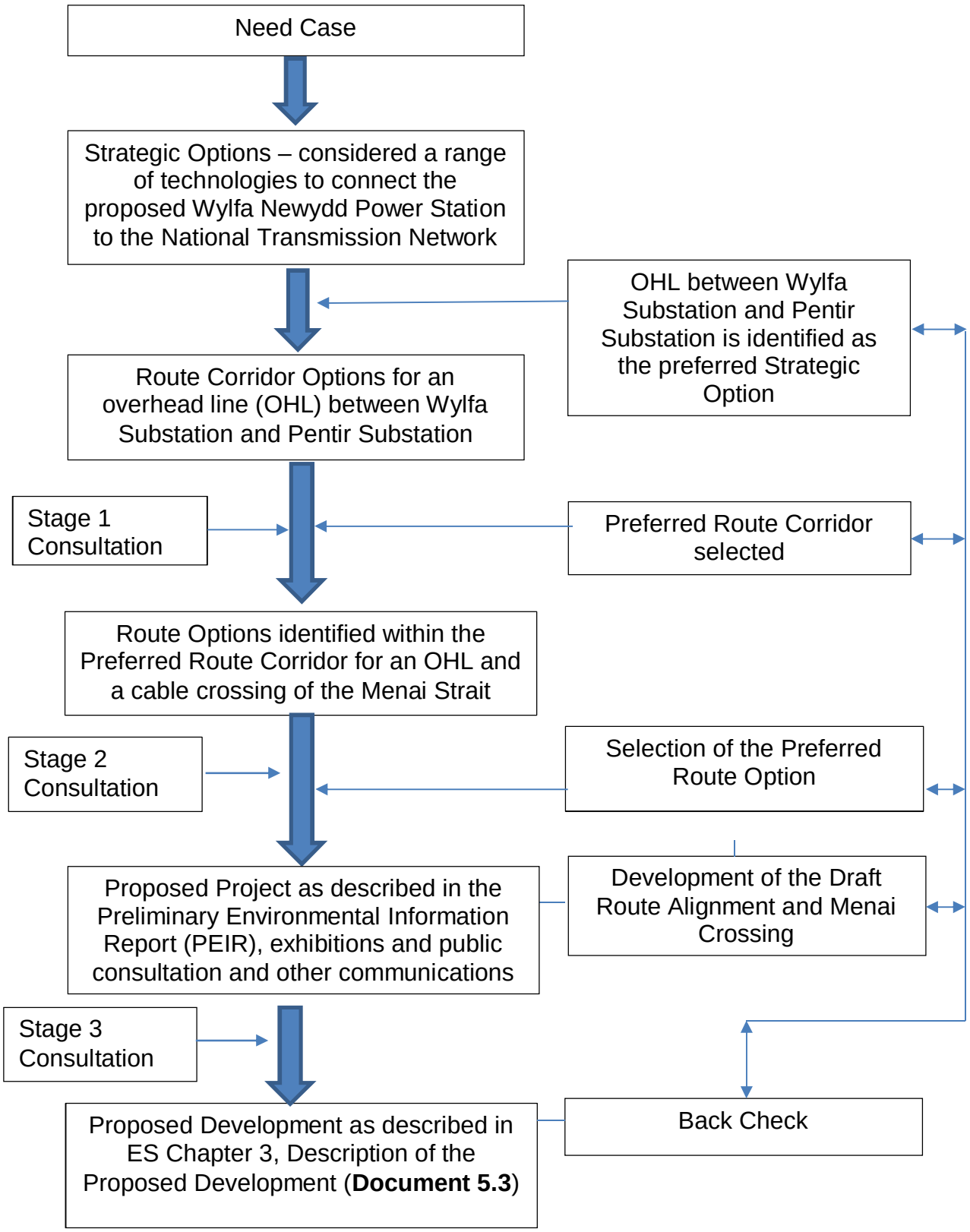
- statutory pre-application consultation: to consult statutory bodies, other agencies and the general public on the details of the proposed application;

- consultation feedback report: review of representations received during statutory pre-application consultation and consideration of suggestions to amend the Proposed Development; and

- back-check and review of options: to take the opportunity to verify that the need case and decisions made in the options and routeing reports remain valid in light of any changes in circumstances.

6.2.3 It is important to acknowledge that these activities have often been conducted in parallel with one another rather than following a linear process. Image 3 below illustrates how National Grid has implemented the above steps.

Image 3: Overview of the Proposed Development Evolution



6.2.4 It is important for the DAS to summarise the project development process to describe how National Grid has designed and revised its design solution in response to local context and consultation responses.

6.2.5 During the evolution of the Proposed Development, and in following the steps outlined above various assessments have been undertaken. These are as follows:

- Strategic Options Report 2018 (**Document 7.2**) – this is an updated version of the Strategic Options Report that was published in October 2012 (**Document 9.8.1**) and subsequently updated in 2015 (**Document 9.8.2**) and 2016 (**Document 9.8.3**). The SOR has been updated a number of times to ensure accurate information was presented at each of the three stages of public consultation. The report appraised a range of options and technologies which could have provided the additional transmission infrastructure and identified a preliminary preferred strategic option which was Option 3 new OHL circuits connecting Wylfa and Pentir;

- Route Corridor Identification Report 2012 (**Document 9.1**) – identified the potential route corridors for the Wylfa to Pentir element of works within the preliminary preferred strategic option and summarised the main environmental and socio-economic features located in each potential corridor. The report identified four route corridors across Anglesey and five crossing points across the Menai Strait to Pentir substation;

- Preferred Route Corridor Selection Report 2015 (**Document 9.2**) – appraised the potential route corridors and identified a preferred route corridor which was the orange route corridor;

- Wylfa to Pentir Route Options Report 2015 (**Document 9.3**) – This report explains how National Grid has identified and screened potential route options for a new electricity transmission line, within the Orange Route Corridor, between Wylfa and the Anglesey AONB at the Menai Strait, and on the Gwynedd side of the Menai Strait, to the Pentir Substation;

- Preferred Route Option Selection Report 2016 (**Document 9.4**) – the orange route corridor was divided into sections this report considers four sections of the route between Wylfa and the Menai Crossing area and explains why the preferred route option was chosen;

- Draft Route Alignment Report 2016 (**Document 9.5**) – explains the design rationale for the new electricity transmission connection;

- Menai Strait Crossing Report September 2016 (**Document 9.6**) – identifies the preferred option for crossing the Menai Strait with the new 400 kV connection and explains why the preferred option was chosen;

- Preliminary Environmental Information Report (PEIR) 2016 (Ref 22) – The PEIR presented the environmental information required to support the statutory consultation, under sections 42 and 47 of the Planning Act 2008. The PEIR provided preliminary information about the potential significant environmental effects of the Proposed Project, based upon data gathered and assessment undertaken at that time.

6.2.6 A Design Report (**Document 7.17**) has also been prepared by National Grid to explain the design rationale for a new electricity transmission connection ('the Proposed Development'). It explains how design choices have sought to reduce the environmental effects of the Proposed Development. It intends to demonstrate how the design has embedded mitigation in order to avoid significant environmental effects wherever possible. This document also details how the Proposed Development responded to comments made during the Stage 3 Consultation.

6.2.7 It is not considered necessary to repeat the detailed description of the route design process, as this is set out in in the Design Report (**Document 7.17**). Therefore this DAS concentrates on the non-linear elements of the Proposed Development i.e. CSEC/THHs as well as modifications to existing substations which are required to support the 400 kV grid connection. A description of the OHL design is therefore presented in section 7 in summary only.

6.2.8 The approach described above has been adopted by National Grid to inform the routeing and site selection of the Proposed Development in an iterative manner which has responded to the physical context and constraints along the original route corridors as well as stakeholder feedback.

7 Design of the OHL

7.1 PYLON DESIGN

7.1.1 National Grid transmits electricity at 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.

7.1.2 Since most of the insulation is provided by air, OHLs tend to be the most economical means to provide power transmission for large quantities of electric power.

7.1.3 The OHLs are carried by pylons which keep the conductors a safe distance from the ground.

7.1.4 When selecting a pylon design, National Grid considers the type of landscape to be built in including near and long distance views. National Grid also looks at opportunities to use existing woodland, valleys and other natural features to help provide screening and backgrounding for OHL development. National Grid also considers noise, local economic activity, heritage, ecology, transport, water resources, engineering and cost, together with any feedback from local landowners, local communities and technical specialists and technical bodies, such as environmental and heritage bodies.

7.1.5 For the North Wales Connection, the existing OHL was a key consideration due to the intention to parallel the existing and proposed OHLs as far as possible.

7.1.6 A variety of pylon designs are available, including different types of steel lattice designs and the T-pylon, which is to be constructed in the UK for the majority of the Hinkley Point C Connection project.

7.1.7 Due to the evolution of pylon design over time and the availability of materials, it is not possible to exactly replicate the existing OHL. National Grid has therefore selected a similar steel lattice pylon (as the existing OHL) for the proposed OHL. This is considered the best option to reduce visual effects as far as possible as it would not introduce contrasting shapes into the

environment. Whilst similar in height and shape to the existing pylons, the new pylons have an overall lighter weight and thinner appearance. The proposed pylons are the lightest weight design that can be used for the project, capable of supporting the number and size of conductors required to enable the proposed connection.

7.1.8 A detailed appraisal of the pylon design options that are available to meet the technical needs of the North Wales Connection Project has been set out in the Preferred Route Option Selection Report 2016 (**Document 9.4**). This concluded that the standard lattice steel pylon design would be the most appropriate design, having regard to a range of environmental, socio-economic, technical and cost considerations, and feedback from consultation. The steel lattice pylon is wide at the bottom and narrowing to the top, anchored on four separate legs for stability and with cross-arms to carry the conductors.

7.1.9 The Flood Consequence Assessment (FCA) (**Document 5.12.2.4**) has demonstrated that the new pylons would be adequately protected from flooding during the construction and operational phases, and would not increase flood risk elsewhere, given that committed mitigation would be implemented.

7.1.10 The Indicative Pylon Schedule (**Document 5.3.2.1**) contains an indicative schedule of the proposed new and retained existing pylons. The schedule also indicates whether a pylon would be a straight line ‘suspension’ pylon (indicated by a D 'type') or a larger angle pylon (indicated by a D followed by a number, which indicates the maximum angle of route deviation that the pylon could accommodate). Larger numbers indicate a broader, bulkier pylon form, which is required to accommodate the additional physical load owing to the angle of deviation. The Schedule also provides indicative details of the anticipated pylon heights.

7.2 OVERHEAD LINE DESIGN

7.2.1 National Grid have planned and designed the operation of the Proposed Development over its lifespan and have taken into account the impacts of climate change as part of the design process. In recognition of this OHL design has considered wind, ice and wind-on-ice loadings. The resilience of pylon design to other aspects of climate change, such as wind and storms and higher temperatures is addressed in National Grid’s published Climate Adaptation Report (Ref 23).

7.3 PARALLEL AND SYNCHRONISED DESIGN

7.3.1 The detailed design work undertaken to identify the 400 kV OHL design of the Proposed Development has set out to develop a synchronised design wherever practicable.

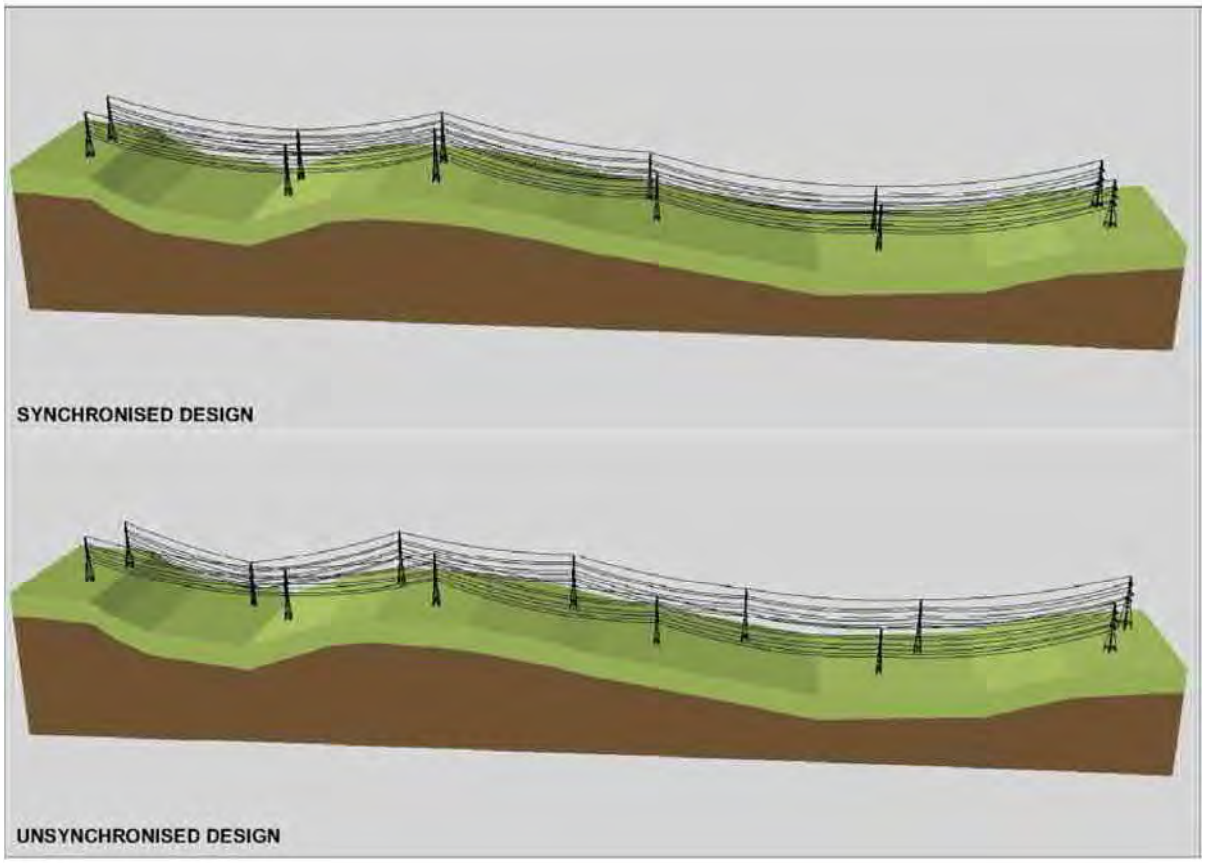
7.3.2 By constructing the new OHL close to the existing line the spread of transmission development, both within the route corridor and across the wider island, would be reduced. In principle, the more closely that the new OHL could parallel and synchronise with the existing OHL between Wylfa and the Menai approach, the more cohesive the design would be and the area affected by transmission infrastructure would be more limited.

7.3.3 Localised constraints to siting of individual pylons have precluded this where an unpaired or less synchronised design would be locally preferable based upon the nature of the receptors local to a given pylon. The Design Report (**Document 7.17**) provides an explanation as to how the evolution of the design has resulted in the Proposed Development for which a development consent order is being sought.

7.4 WHY IS SYNCHRONICITY IMPORTANT?

7.4.1 Where sections of the existing and new OHLs would run in close proximity or parallel to each other, the siting and heights of the new pylons relative to the existing pylons becomes particularly important in visual terms. If the pylons and sag of the conductor in each span were substantially out of step, then the visual 'flow' of the two lines would be discordant, potentially resulting in greater visual effects than a synchronised design. This effect is illustrated in the sketch in Image 4 below.

Image 4: Illustrative Sketch of Synchronised and Unsynchronised Design



7.4.2 This visual effect could be reduced or avoided if new pylons are located adjacent to the existing pylons and are of a similar height, synchronising the rise and fall of the two lines across the landscape. This has been considered in detail during development of the design as shown on the Works Plans (**Document 4.4**).

7.4.3 There are no known policies or guidance documents that specifically refer to the synchronising or pairing of pylons when routeing parallel OHL. However, when considering routeing of transmission lines, National Grid employs the Holford Rules as the basis for the approach to routeing. These rules mainly consider the visual effects from OHLs. Rule 6 relates to multiple OHLs and states:

'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 or 'wirescape'.'

7.4.4 In addition to this rule, the following note on Rule 6 states:

'In all locations minimise confusing appearance. Arrange wherever practicable that parallel or closely related routes are planned with tower types, spans and conductors forming a coherent appearance; where routes need to diverge, allow where practicable sufficient separation to limit the effects on properties and features between the lines.'

7.4.5 National Grid considers that achieving a coherent appearance includes the pairing or synchronising of pylon locations where practicable.

7.4.6 Landscape/visual effects desk top and site based appraisals were undertaken of existing parallel 400 kV OHLs and looked at the appearance and benefits of synchronising parallel lines. A 3D model was also developed to explore the benefits of synchronising pylon locations and to help determine what longitudinal difference between 'opposite/paired' pylons would make them appear unsynchronised.

7.4.7 After considering existing 400 kV OHLs and the 3D modelling the following has been observed:

- views that are from locations perpendicular to a route or long distance views from more elevated locations looking along two parallel lines benefit more from pylons being paired or synchronised;
- synchronised pylons reduce the appearance of a 'wirescape' in views perpendicular to two parallel lines;
- synchronised pylons do not appear to be paired in many views due to varying viewing angles and perspectives;
- previous projects which have used synchronised pylons give a sense of coherency and of a route being planned and logical;
- topography and routeing play a part in how well synchronisation works - flatter more open landscapes with straighter alignments benefit more from paired pylons, particularly in more distant views; and
- the relationship between the height of the pylons and the longitudinal deviation appears to determine when pylons could be termed as synchronised, e.g. when the distance between the pylons is greater than the height of the pylons, the overall effect is one of being unsynchronised.

7.4.8 The following conclusions are made on the definition of synchronisation when referring to two parallel 400 kV OHLs using approximately 50 m pylons.

- **Synchronised** - Pylons are considered to be synchronised when they are located directly perpendicular to each other or are almost perpendicular within a maximum deviation of 20 m from the centre of the two pylons.

- **Broadly Synchronised** - Pylons are considered to be broadly synchronised when they sit almost perpendicular to each other within a maximum longitudinal deviation of between 20 and 50 m from the centre of the pylons up or down the line. Being broadly synchronised still gives a level of coherency between the two lines as in some views the pylons would still give an impression of being paired, but less so in views perpendicular from the line.

7.4.9 Anything beyond 50 m is not considered to be synchronised.

7.4.10 Achieving synchronicity wherever practicable has been an important objective in developing the design as shown on the Works Plans (**Document 4.4**).

7.5 OHL TRANSPOSITION POINTS

7.5.1 Transition points are described in section 2.4.5. The 'swapping over' of circuits from one OHL to another takes into account the design, orientation and position of existing pylons to allow for as many existing pylons to be retained and re-used as possible to reduce the number of new build pylons.

7.5.2 Three OHL transpositions are proposed as part of the Proposed Development.

7.6 PYLON POSITIONS

7.6.1 Specific locations for pylons are shown on the Works Plans (**Document 4.4**). It should be noted however that these locations are not secured, as discussed in sections 1.4 and 2.9. The proposed alignment of the OHL would be subject to LOD to provide a necessary and proportionate degree of flexibility. The LOD has been restricted in certain locations to limit potential effects on a specific receptors.

8 Design of the THHs and CSECs

8.1 INTRODUCTION

8.1.1 To enable the Proposed Development to cross the Menai Strait, an operational CSEC is required each side of the Menai Strait to allow the transition from OHL to underground cable and back again. A THH would also be required to provide maintenance access to the tunnel and tunnel shafts. One THH would contain ventilation equipment to regulate the temperature in the tunnel. Pumping equipment would be required to remove any water ingress from the tunnel and shafts. The THH/CSECs are proposed adjacent to one another in the same operational compound with a shared access road, to ensure efficiency of design and to maximise opportunities for vegetation screening.

8.1.2 Following the routeing and optioneering assessments outlined in paragraph 6.2.5 two sites on either side of the Menai Strait have been identified as locations for THHs: Braint on Anglesey and Tŷ Fodol in Gwynedd.

8.1.3 The Design Guide (**Document 7.19**) has been produced which presents the overall THH/CSEC sites and context analysis followed by the potential design approaches, colour and materials palettes to provide a clearer understanding of the likely form of these elements. The purpose of the Design Guide is to provide a framework of design principles within which National Grid would develop detailed design proposals.

8.2 PROPOSED INFRASTRUCTURE

Cable Sealing End Compound

8.2.1 A CSEC is required when an overhead line changes to an underground cable or vice versa. CSECs are secure sites surrounded by a palisade fence where the overhead conductors are connected to the ends of buried cables which are brought vertically upwards out of the ground. The compound usually contains cable terminations (cable sealing ends), electrical equipment and support structures. A terminal pylon acts as a support for the conductor system and ‘down-leads’, that feed each circuit onto the cable sealing ends. A connection is provided to the electrical equipment via landing structures

designed to take the tension force. The design of the above elements are fixed by technical and operational requirements.

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

Tunnel Head Houses

8.2.3 THHs would be required on top of the shaft cover slabs to provide direct access into the shafts and tunnel for inspection and maintenance. The head house would also contains all necessary ventilation equipment and utilities. Typically equipment inside the head house, shaft and tunnel would comprise:

- lighting systems;
- heating and air conditioning units;
- radio systems (for personnel to communicate with each other when in the tunnel during construction and over operational life of the asset);
- stairwell ventilation (required to maintain safe and clean air for personnel to enter the tunnel via the shaft);
- person and goods lift (capable of taking personnel and equipment into the tunnel);
- system ventilation (needed primarily to maintain a correct temperature in the shaft and tunnel to ensure that the cables do not overheat. It can be natural air flow backed up with mechanical fans if required);
- gas monitors (to ensure tunnel is free from gas ingress before workers persons enter);
- Distributed Temperature System (DTS) (to measure the temperature of a core/cable. This is part of the overall system design and works in conjunction with the system ventilation);
- pumped drainage (to collect and pump out ground water in the tunnel and shaft);
- generators (maybe permanent or temporary) (a tunnel requires a power supply, and a backup system should this supply fail. Generators can either be brought to site in the event of a failure or left in situ); and

- tunnel inspection vehicle (a vehicle used travel along a tunnel for the purpose of inspection of the cables and carrying equipment to point of any cable or joint failure).

8.3 DESIGN APPROACH TUNNEL HEAD HOUSES

8.3.1 The design approach was based on several considerations regarding the functional requirements for the THH in terms of both engineering as well as design and contextual issues. Some of the main considerations in the design approach discussions included:

- The need for cooling and ventilation fans, as they tend to determine the highest point of the built form. Generally air is expelled at the highest point of any tunnel, working with rather than against the natural direction of airflow. In this case the highest point of the tunnel would be at Tŷ Fodol, and therefore it is proposed that air is extracted using larger fan units located at this end of the tunnel. In Braint, the height would be kept at a minimum as tunnel ventilation fans are not required at this end of the tunnel. The Tŷ Fodol built form needed to be higher to accommodate bigger fan units. Smaller stairwell ventilation fans are also required at both Braint and Tŷ Fodol;

- The THHs also need to accommodate associated welfare facilities and some of the control rooms which could be lower in height;

- Vehicle access points for maintenance and plant replacement, shaft access gantry cranes etc. are other design considerations. The design approach includes placing such features along less sensitive interfaces.

8.3.2 The functional requirements have influenced the overall design approach in terms of determining internal heights, placement of single and double storey areas, minimum likely footprint dimensions, minimum height requirements etc. as determined by mechanical and safety specifications. A design aim has been to balance the functional requirements against the need to limit the apparent scale of the buildings in rural, generally undeveloped, locations.

8.4 DESIGN FLEXIBILITY

8.4.1 National Grid is not able to submit a detailed fixed design for the THHs due to the need to retain flexibility to accommodate design innovation and allow a range of design solutions to be put forward, ensuring high quality, cost effective designs are achievable. There is limited flexibility in the location of THH/CSEC, as they must be located within the locations shown on the Works Plans (**Document 4.4**) and within the maximum design parameters shown on the Design Plans (**Document 4.13**).

8.4.2 Given the rural, sensitive settings that these THH/CSECs would be located in, National Grid is, however, committing to a hierarchy of control measures which would serve to limit the final scale and form of the buildings.

8.4.3 The design parameters shown on the Design Plans: Tŷ Fodol THH/CSEC Parameter Plan DCO_DE/PS/09_05 Sheet 5 of 8 and Braint THH/CSEC Parameter Plan DCO_DE/PS/09_01 Sheet 1 of 8 (**Document 4.13**) impose absolute restrictions on the building location and scale. They determine zones within which the THHs would to be sited and suggest maximum heights and maximum volume for the buildings, which are specific to the functional requirements at each of the two THH/CSEC sites. Maximum footprint dimensions in terms of length and width have not been stipulated as it is believed that a modest increase in building footprint (albeit within the location parameters imposed) might allow some elements of the building to be reduced in height, and potentially afford opportunities to further break up the overall massing.

8.4.4 There is a requirement in the draft DCO (**Document 2.1**) that states that: Unless otherwise agreed with the relevant planning authority, the authorised development comprised in Works No 8 (Braint Tunnel Head House and Cable Sealing End Compound to Tŷ Fodol Tunnel Head House and Cable Sealing End Compound) must be carried out in general accordance with the Design Principles set out in sections 2.7.2 & 3.7.2 of the Design Guide (**Document 7.19**).

8.5 STAKEHOLDER ENGAGEMENT

8.5.1 At the initial stakeholder engagement meeting National Grid presented three suggested design approaches for the tunnel head house structures:

- Approach 1: standard Industrial approach;
- Approach 2: architectural statement; and
- Approach 3: rural architecture approach.

8.5.2 The general consensus from discussions with officers working for both local authorities was that the ‘Rural Architecture’ style would be more appropriate in the given contexts of both the Braint and Tŷ Fodol THH/CSEC sites. However, the two THH/CSEC sites have distinctly different landscape and characteristics, which have had to be considered in the design development. Some main differences include:

- the Braint landscape character is considered as being more planned and is heavily influenced by the estate architecture found in the surrounding context; and

- the Tŷ Fodol context is characterised by large farms and agricultural buildings that have extended gradually over time.

8.5.3 More details of the stakeholder engagement for each THH/CSEC site is presented in the relevant sections below.

8.6 BRAINT THH/CSEC

Existing Site Context

8.6.1 The Braint THH/CSEC would be located within pasture land between properties known as Rhosbothan (approximately 500 m north-west), Llwyn-ogan (approximately 200 m north-east) and Tyddyn Fadog (approximately 340 m south-west). The general local character of the area is rural pasture land with agricultural plots bordered by small blocks of woodland, spinneys and coverts associated with the local estates. The strong historic character of this landscape and its sparsely settled character, results in a strong sense of place enhanced by its scenic setting.

8.6.2 The Braint THH/CSEC would fall within Landscape Character Area (LCA) 12 (East Central Anglesey), reflects much of the typical undulating landscape of Anglesey. The majority of the area consists of improved grassland interspersed with scattered areas of semi-natural habitat. Hedgerows and hedgebanks (and cloddiau) form field boundaries, and where rock outcrops exist, stone walls are more typically field boundaries.

8.6.3 The underlying geology is varied, with glacial deposits in the east and more mixed intrusive and sedimentary features in the west. Central parts of the relevant LCA are influenced by the A5 trunk road, now superseded by the A55 trunk road, which runs relatively parallel. Settlements vary from nucleated to dispersed patterns.

8.6.4 Southern Anglesey Estatelands Special Landscape Area is located in southern Anglesey, west of the town of Llanfairpwll. It covers part of the Marquis of Anglesey's estate, which lies immediately to the north of the AONB-designated shoreline of the Menai Strait. It is considered to provide a valued setting to Anglesey AONB and the Grade I listed parkland of Plas Newydd. The Menai Special Landscape Area lies immediately to the south of the Menai Strait in Gwynedd.

8.6.5 The Bryn Celli Ddu Burial Chamber and Standing Stone Scheduled Monuments are located south-west of the proposed Braint THH/CSEC site. Views towards the proposed Braint THH/CSEC site from the Scheduled Monuments would include small scale pasture, the Bryn Celli Ddu farm and diary units, woodland blocks with the existing 400 kV OHL visible on the horizon and an existing lower voltage lattice OHL visible in the mid ground. Braint THH/CSEC would be completely screened by the farm buildings and new dairy unit to the east.

8.6.6 The small settlement of Star is located on higher ground to the north of the proposed Braint THH/CSEC site. The proposed Braint THH/CSEC would be visible as a small part of the expansive view from Star which includes the mountains of Snowdonia, and more distant Llŷn Peninsula as the backdrop to the undulating lowland landscape to the south of Star. The existing 400 kV OHL is visible to the east crossing over the Menai and a lower voltage lattice line is also visible to the south.

8.6.7 The proposed Braint THH/CSEC would not be directly visible from the Grade I listed country house of Plas Newydd House and Gardens, located on the northern bank of the Menai Strait. There would be some views of the proposed Braint THH/CSEC from the A4080, which is located to the east of the proposed Braint THH/CSEC running north-east, south-west, however these would be filtered by existing roadside vegetation, undulating landform and intervening woodland blocks.

8.6.8 Site visits to the area identified that both rural landscape and local estate architecture are key influences in the area of the proposed Braint THH/CSEC. Key features of the rural landscape include: grassland fields with trees and planting; formal blocks of planted estate woodland; stone walls and cloddiau; barn architecture and compacted stone access routes.

8.6.9 The area is heavily influenced by the Plas Newydd and Plas Coch estates and some of the key feature of the estate architecture include: bold and iconic architecture surrounded by planting and woodlands that filter views of buildings; stone walls; statement architecture surrounded by plantation and tower features and chimneys.

Stakeholder Engagement

8.6.10 At the initial stakeholder engagement meeting in May 2017, it was suggested that, as a general design approach, a farmstead or estate style building surrounded by trees that give glimpses of the proposed Braint THH/CSEC would be preferred.

8.6.11 Officers from the Isle of Anglesey Country Council also suggested that a built form that doesn't stand out, but pays due regard to the existing, and often different styles evident in the local vernacular, would be preferred. It was thought that a low-key built form with natural materials might more comfortably be accommodated within the landscape. In terms of building materials, it was suggested that stone should be considered but rendered finishes were unlikely to be appropriate. More traditional roof forms would be suited in this locality rather than wavy or organic roof forms. Extensive mounding was also considered inappropriate in this location.

8.6.12 Officers also considered that the access design should not overuse tarmac or other visually stark materials in this rural environment. A mosaic of different materials and surfaces, reinforced grass or coloured aggregate with complementary landscape treatments to screen access routes, should be considered.

8.6.13 It was also felt that careful consideration should be given to views to and from Bryn Celli Ddu Scheduled Monument, the community of Star and the A4080.

Design Vision

8.6.14 The aspiration for the THH at Braint would be to create a built form which reflects influences of the local vernacular architecture but does not stand out in the context of this rural area. The built form would be surrounded by proposed vegetation which mitigates the direct views but provides glimpses into the built form, reflecting the visual imagery of the estate style architecture.

8.6.15 The key design approach to massing has been to take the operational spaces that are required and break them down into four massing blocks that could be articulated and modulated to create a more visually interesting built form.

Site Use

8.6.16 The proposed Braint THH/CSEC site would contain two gantries, cable sealing end (CSE) equipment which provides the transition from an OHL to underground cable, underground cable in concrete troughs, the THH, which is required to provide maintenance access to the tunnel and tunnel shafts, ventilation for the stairwells and landscaping areas.

Parameters

8.6.17 Design Plan DCO_DE/PS/09_01 Sheet 1 of 8 (**Document 4.13**) shows the maximum parameters within which Braint THH/CSEC would be developed. This parameter plan shows the maximum height and volume of the THH building, the zones within which the THH and gantries would be located within

the site, and the zone within which the permanent access road would be located.

Building Form Options

8.6.18 Three design options were developed following the initial stakeholder engagement, where the rural architecture approach was determined the most appropriate, and were presented to key stakeholders in August 2017.

8.6.19 Option one focused on breaking up the massing of the building into four parts with distinct roof forms while breaking up the walls with a mix of materials. Key design features included the following:

- a higher built form to the front of the site, stepping down to the back to present a lower built form profile when viewed from Star;
- double gable-ended roof with a barn or stock-shed style roof profile to create visual interest along the front elevation;
- lower pitched roofs to the back;
- further lowering of the mass closest to Star for visual articulation;
- architecturally enhanced louvres using a suitable colour palette, detailing etc. The physical dimensions of the louvres would largely be dictated by operational considerations such as air flow rates and noise attenuation. Potential for stone or brick lintels to reflect local architecture;
- wall faces broken up into two sections. The lower half having a visually heavier material such as stone cladding or gabion wall with waste slate. The upper section would be brick or lighter patterns of stone; and
- the front elevation having a more enhanced material palette while the rear sections would have coloured metal cladding with colours that blended into the landscape.

8.6.20 Option two explored an estate style massing, roof profile and materials, not necessarily imitating the style but reflecting the local vernacular architecture. Key design features included:

- a stepped roof feature for the facade wall reminiscent of Plas Coch but designed in a contemporary style creating an engaging front facade;
- a pitched roof behind the facade stepped profile in slate-effect panels or muted coloured metal panels to create a low profile;

- higher massing along the front facade over the shaft stepping to minimum required heights in the mass that may be potentially visible from Star;
- vaulted roofs for rear sections to reduce the visual impact that pitched roof reflections could have for the mass potentially visible from Star;
- a front wall face broken into two sections with stone in the lower section and potentially brick or muted colour metal work to the top. Alternatively, the front facade could have stone cladding for the full extent. The side walls could have muted colour metalwork;
- architecturally enhanced louvres using a suitable colour palette, detailing etc. The physical dimensions of the louvres would largely be dictated by operational considerations such as air flow rates and noise attenuation. Potentially for stone or brick lintels to reflect local architecture; and
- slate-effect panels or muted grey metal sheets could be considered for roofs.

8.6.21 Option three explored a style and design language inspired by Plas Newydd Home Farm, with the intention being to reflect on the design elements and form rather than mimic them. Key design features include:

- a higher front massing element with a low hipped roof with slate-effect panels or muted coloured metal roofing and short overhang reminiscent of Plas Newydd Home Farm architecture;
- a mid rise tower feature over the stairs and lift shaft as a design feature to enhance the front elevation. This feature could have louvres to enhance visual articulation and a rounded top;
- vaulted roofs for rear sections to reduce the visual impact that pitched roof reflections could have for mass potentially visible from Star;
- further lowering of the mass closest to Star for visual articulation;
- architecturally enhanced louvres using a suitable colour palette, detailing etc. The physical dimensions of the louvres would largely be dictated by operational considerations such as air flow rates and noise attenuation. Potential for arched stone or dark brick lintels to reflect local architecture depending on cost and functional viability;
- using smaller fenestration and openings to add visual interest to the façades; and

- stone walls or cladding with feature elements to provide an interesting front elevation while the side walls could have wood-effect panels or similar, striated cladding.

Building Form Preferred Option

8.6.22 Following stakeholder feedback in August 2017 a revised version of Option three emerged as the preferred design approach, with the following design principles:

- the building volume would not exceed 4350 m^3 with a maximum building height of 8 m;
- front massing to be designed as a high element with a low gable roof, with slate-effect panel roofing and short overhang, reminiscent of Plas Newydd Home Farm architecture;
- vaulted roofs with corrugated metal for rear sections to reduce the visual impact that pitched roof reflections could have for views from Star. The mass closest to Star would be lowered further to provide visual articulation depending on functional constraints;
- architecturally enhanced louvres using a suitable colour palette, detailing etc. The physical dimensions of the louvres would largely be dictated by operational considerations such as air flow rates and noise attenuation. Potential for stone or dark brick lintels to reflect local architecture depending on cost and functional viability;
- the use of smaller recesses to add visual interest to the facades;
- building facades to be broken with visually heavy stone walls or cladding along bottom half and linear metal or wood-effect, striated cladding for the top half; and
- potential to transition stone base to metal cladding on side elevations reminiscent of old farms and as a cost efficient design.

8.6.23 The Design Guide (**Document 7.19**) provides examples of the materials pallet and indicative colour pallet to be used for the built form, access and surface treatments and fencing.

Landscape Design Approach

8.6.24 Landscaping is proposed around the THH/CSEC operational compound within the site boundary perimeter fence (outwith the security fencing); the indicative area within which landscape planting would be located is illustrated

on DCO_DE/PS/09_01 Sheet 1 of 8 (**Document 4.13**). The indicative landscaping proposals for this area are shown on Environmental Statement Figure 7.14 (**Document 5.7.1.14**).

8.6.25 The landscape mitigation proposals would include the use of native species of local provenance, where available.

8.6.26 The proposed landscape setting and design approach for the Braint THH/CSEC is as follows:

- existing trees would be retained along the south-eastern boundary to filter views from the east from properties at Llwyn Edwen (500 m);
- proposed planting and mounding around the northern and southern boundaries would help to filter views from Star and Tyddyn Fadog;
- the shape of proposed woodland blocks mimic the surrounding woodlands to integrate the site with the characteristics of the Southern Anglesey Estatelands Special Landscape Character Area within which the site lies;
- the attenuation pond would be designed as a part of the landscape setting of the site and to offer biodiversity benefits;
- land to the south and west of the site to be raised and returned to agricultural use;
- planting mixes to comprise largely indigenous species with both deciduous and evergreen components to provide year round screening and biodiversity benefits;
- locally appropriate wild flower seeding mixes to be used to provide interest and biodiversity benefits for invertebrates; and
- potential opportunities for other wildlife enhancements to be incorporated including bird nesting boxes and establishing wider movement corridors.

Design

8.6.27 A THH/CSEC site layout is illustrated on Design Plan DCO_DE/PS/09_02 Sheet 2 of 8 (**Document 4.13**) and Design Plan DCO_DE/PS/09_04 Sheet 4 of 8 (**Document 4.13**). A visualisation of the Braint THH/CSEC is provided in Figure 2. The illustrative footprint and layout has been determined by the operational requirements as well as environmental and safety considerations.

8.6.28 The Braint site (operational compound and landscaping) would occupy an area of approximately 47,700 sq m (79,000 sq m inclusive of the area within which the permanent access track would be located (the permanent access track would be approximately 4 m wide located within the wider swathe)). The operational compound would occupy an area of approximately 8,640 sq m. The platform level at Braint would be 35.38 metres Above Ordnance Datum (mAOD).

8.6.29 The THH/CSEC operational compound would be surrounded by a 2.4 m mesh or palisade security fence topped with an electric pulse fence to a height of 3.4 m, this is illustrated on Design Plans DCO_DE/PS/09_03 Sheet 3 of 8 and Design Plan DCO_DE/PS/09_04 Sheet 4 of 8 (**Document 4.13**).

8.6.30 The area inside of the security fence would comprise two gantries which would be 14.9 m high, CSE equipment which provides the transition from an OHL to underground cable, Distribution Network Operator's (DNO) supply and compound, portable relay room, THH which is required to provide maintenance access to the tunnel and tunnel shafts, cable troughts, 400 kV underground cables, firefighting water tank if required, oil separator and internal vehicular access.

8.6.31 The attenuation ponds and water storage tank would be located within the site boundary perimeter fence but beyond the security fence (operational compound). The example alignment of the tunnel means that any seepage into the tunnel during operation would be pumped out through Braint shaft; it is possible that this could include saline water. The site layout includes an area for saline water treatment, if required, this is illustrated on Design Plan DCO_DE/PS/09_02 Sheet 2 of 8 (**Document 4.13**).

8.6.32 The above ground elements of the THH/CSEC would have formal drainage systems, with runoff from impermeable surfaces draining to an attenuation pond prior to discharge to nearby watercourses at the outfall locations that will be retained from the construction phase. Saline treatment areas would be provided for shaft and tunnel dewatering, if required (See **Document 4.13,** DCO_DE/PS/09 SHEET 2 OF 8). An outline drainage strategy for the THH/CSEC is provided in the Flood Consequences Assessment (FCA) (**Document 5.12.2.3**). The outline drainage strategy allows for the attenuation of runoff to QBAR greenfield rates for all events up to the 1% AEP event, including an appropriate allowance for climate change. Furthermore, a detailed drainage design that is consistent with the outline strategy will be produced as part of the Drainage Management Plan (DMP) for the Proposed Development that is secured through Requirement 7 of the draft DCO (**Document 2.1**).

8.6.33 Further to flood modelling, it has been shown that there is no fluvial flood risk to the Braint THH/CSEC during the 0.1% Annual Exceedence Probability (AEP) event (+75% climate change allowance on inflows). There would be a risk of impacts arising from obstructing the surface water flow path in the northern and eastern areas of the site due to the raising of the land. However, the risk from surface water flooding is considered to be 'low' due to the low range of depths and flood hazard rating. There would be a negligible risk of groundwater water flooding due to the low range of depths likely given the topography around the site. There would be a medium risk of internal surface water flooding if there were no robust on-site water management systems and site discharge restrictions in place.

8.6.34 Climate change is of particular relevance to the Braint THH/CSEC as it is possible that the site may be at risk of fluvial flooding under the 0.1%AEP event including the Upper End climate change allowance (+75% on inflows under that scenario) and hence adaptation measures may need to be considered in future.

8.6.35 The FCA (**Document 5.12.2.3**) has demonstrated that the site is located in Development Advice Map (DAM) Flood Zone A and the fluvial flood modelling carried out does not change this conclusion. As a result neither the Sequential Test nor the Exception Test is applicable. It has also demonstrated that the site would be adequately protected from flooding, and would not increase flood risk elsewhere.

8.6.36 The THH building volume will not exceed 4350 cubic metres (m^3) with a maximum building height of 8 m. Details of the building, including their design, external appearance, colour and surface finish would be in general accordance with the design principles set out in the Design Guide (**Document 7.19**) as secured by Requirement 4 in the draft DCO (**Document 2.1**).

8.6.37 Under normal operational conditions the THH/CSEC would not be lit. Lighting would be required during planned or unplanned maintenance activities. Lighting would be required to allow the safe movement of vehicles and pedestrians at night within the operational boundary. The minimum exterior lighting requirements would be:

- maintained average illuminance: 6.0 lux; and
- maintained minimum point illuminance: 2.5 lux.

8.6.38 These requirements apply to all perimeter fencing and gates and permanent access roads, verges, footpaths, designated walkways and areas occupied by plant or other equipment contained by the operational fence line.

8.6.39 Additional portable lighting would be used for both planned and unplanned maintenance activities. This would be brought to site when required and removed on completion of the maintenance activity.

8.6.40 Landscaping is proposed around the operational compound within the site boundary perimeter fence; the indicative area within which landscape planting would be located is illustrated on DCO_DE/PS/09 Sheet 1 of 8 (**Document 4.13**). The landscaping proposals that form part of the DCO application have been designed to filter views and integrate the site within the characteristics of the surrounding Special Landscape Character Area. The indicative landscaping proposals for Braint are shown on Environmental Statement Figure 7.14 (**Document 5.7.1.14**) and are summarised in the Design Guide (**Document 7.19**). The mitigation planting is secured by Requirement 9 and 10 of the draft DCO (**Document 2.1**).

Access

8.6.41 The Braint THH/CSEC would be served by a new permanent 4 m wide access road to provide permanent access for National Grid (and its representatives) to undertake maintenance and repair works. Access would be taken directly from Unnamed Road 22 (Link 15) Environmental Statement Figure 13.7 (**Document 5.13.1.7**) which connects the A5 west of Llanfairpwll with the A4080 (Brynsiencyn Road) at Victoria Cottages. The new junction with the Unnamed Road 22 (Link 15) (**Document 5.13.1.7**) would allow appropriate visibility splays. The location of the permanent access track is shown on Design Plan DCO_DE/PS/09_01 Sheet 1 of 8 and Design Plan DCO_DE/PS/09_02 Sheet 2 of 8 (**Document 4.13**).

8.6.42 Details (design and layout) of the permanent highway access arrangements would be secured by Requirement 17 of the draft DCO (**Document 2.1**), which requires submissions to be approved by the local planning authority (in this instance Isle of Anglesey Country Council).

8.6.43 Access to the operational compound would be controlled by a 3.6 m wide 5 bar lockable metal field gate. Given the nature of the infrastructure, no public access would be permitted.

8.7 TŶ FODOL THH/CSEC

Existing Site Context

8.7.1 The Tŷ Fodol THH/CSEC would be located within two existing agricultural fields to the north-west of Pentir Substation, south of Fodolydd Lane.

8.7.2 The Tŷ Fodol THH/CSEC would be located between properties known as Fodol (200 m), Vodol-isaf/Vodol Cottage (200 m) and Garth Fawr (380 m). To the south of the proposed site is Nant-y-garth, a wooded ravine which contains a landfill site. Views of the proposed Tŷ Fodol THH/CSEC from Vodol-isaf/Vodol Cottage would be screened by land form. Views of the proposed Tŷ Fodol THH/CSEC from properties at Fodol and Garth Fawr benefit from some existing screening from landform. A tributary of the Nant Cefn flows in a westerly direction, approximately 170 m south of the site. The site is located at approximately 80 m AOD, on ground that rises to the south-east to approximately 90 m AOD.

8.7.3 The proposed Tŷ Fodol THH/CSEC would fall within the LCA 4 (Caernarfon Coast and Plateau), a long broad fringe adjacent to the Menai Coast LCA 16 extending to the upland fringes of Moel Tryfan and Mynydd y Cillgwyn influenced by glacial actions and resultant deposits and landforms. There is a mixture of settlement types – small villages to large towns with Caernarfon being an important historic core, with modern settlement edges of varying quality. A range of coastal habitats and landscapes contribute to the character of the area.

8.7.4 Some of the eastern and northern parts of the area (Dinorwig and the Nantle Valley) have been included in the Register of Landscapes of Outstanding Historic Interest in Wales. In addition, the castle and town walls of Caernarfon are internationally recognised as a World Heritage Site. The area displays a complex mix of historic landscapes of different characters and periods, dominated by 19th century estate farmland with valued areas of parkland remaining (e.g. at Glynllifon). Interspersed amongst the estate lands are prehistoric remains including ancient hut circles and hillforts.

8.7.5 A standing stone (not publicly accessible) which is a Scheduled Monument is located to the west of the proposed site. Views from the stone are generally open and the proposed Tŷ Fodol THH/CSEC would be visible over the top of woodland that is located at the base of a small incised valley. The tops of the existing 400 kV OHL pylons are visible on the horizon beyond and the mountains of Snowdonia form a backdrop in the view.

8.7.6 There is at least one prehistoric/Roman enclosed hut circle settlement. Fodol Ganol Enclosed Hut Group is a Scheduled Monument located approximately 400 m to the east of the proposed THH/CSEC, with a further potential example 130 m to the west.

8.7.7 Holiday lets are present to the south-east of the site. These would have views towards the proposed Tŷ Fodol THH/CSEC, though filtered by existing

vegetation. Views to the proposed Tŷ Fodol THH/CSEC from Frodolydd Lane would be filtered by existing vegetation along the narrow lane.

8.7.8 Vaynol Historic Park and Garden is a country estate originating from the Tudor period. There are no direct views into the site from this estate.

8.7.9 Site visits to the area identified that both rural landscape and local estate architecture are key influences in the area of the proposed Tŷ Fodol THH/CSEC. Key features of the rural landscape include: grassland fields with border trees and planting; narrow access roads, stone fencing; barn architecture; metal sheet clad walls and compacted mud access routes.

8.7.10 Some of the key feature of the estate architecture include: the standing stone Scheduled Monument, which denotes the historic significance of this area, the rustic complex of Vaynol Home Farm, the grand gateway statement and iconic stone wall of Vaynol park; stone walls; rural and agricultural character and woodlands adjoining the Menai Strait.

Stakeholder Engagement

8.7.11 At the initial stakeholder engagement meeting in May 2017, the main design theme that emerged was that a design approach reflecting the local vernacular and rural architecture, which is predominantly agricultural in style, would be more in keeping with the area.

8.7.12 The predominant materials in the area are stone, timber and metal. It was felt that a design that is relatively low key and able to blend into the landscape would be preferred.

8.7.13 The Welsh Water treatment works at Garndolbenmaen was stated as a good local example of where good design has been implemented in a rural landscape for a utilities infrastructure scheme.

8.7.14 The design narrative of an agricultural farmstead that has extended gradually over time, formed through various extensions, hence varied massing, materials and roof profiles, was considered an interesting narrative to take forward.

8.7.15 The use of a mix of forms, materials and roof profiles to create a more broken up massing, while being mindful of the internal operational requirements, was considered a key design approach.

8.7.16 The operational compound is going in a location that could affect the view of the mountains from the Standing Stone Schedule Monument, hence the built form and landscape treatment impact on the setting of the Scheduled Monument would be a critical consideration.

Design Vision

8.7.17 The aspiration for the THH at Tŷ Fodol is to create a built form that reflects influences of the local agricultural architecture and blends into the landscape through appropriate massing, materials, colours and treatments. The building must reflect a narrative of having grown over time through a series of massing, a mosaic of treatments and articulation.

8.7.18 The key massing design approach was to move ancillary and welfare units to the front of the building to achieve lower built form to the front elevation, and step the higher ventilation unit to the back.

8.7.19 Views from the Standing Stone, nearby residences and holiday lets have been a key consideration. The massing and roof profiles step down towards these views to achieve further articulation and to break up the massing.

Site Use

8.7.20 The proposed Tŷ Fodol THH/CSEC site would contain two gantries, CSE equipment which provides the transition from an OHL to underground cable, underground cable in concrete troughs and the THH, which is required to house the tunnel ventilation and provide maintenance access to the tunnel and tunnel shafts, ventilation for the stairwells and landscaping areas.

Parameters

8.7.21 Design Plan DCO_DE/PS/09_05 Sheet 5 of 8 (**Document 4.13**) shows the maximum parameters within which Tŷ Fodol THH/CSEC would be developed. This parameter plan shows the maximum height and volume of the THH building and the zones within which the THH and gentries would be located within the site.

Building Form Options

8.7.22 Four design options were developed following the initial stakeholder engagement, where the rural architecture approach was determined the most appropriate, and presented to key stakeholders in August 2017.

8.7.23 Option one focused on breaking up the massing of the building into four parts with distinct roof forms while breaking up the walls with a mix of materials. Key design features included the following:

- ancillary and welfare rooms placed to the front of the site to create a lower built form;

- access rooms and smaller ventilation units placed in a higher built form, creating a step up;
- the fan room placed at the back of the site as the biggest mass, but steps down towards the Standing Stone;
- stepped, pitched roofs reflect the slope of mountains to use backgrounding and to reduce light reflection;
- wall massing broken into sections with lower section with visually heavy stone finishes while the upper section could be wood panelling (subject to fire safety design) or metal cladding in muted green or grey tones;
- additional fenestration, over what is required for operational purposes to enhance visual articulation; and
- the front roofs could be of slate-effect panels while higher roofs could be metal sheets with muted grey or green colour.

8.7.24 Option two explored varying the roof forms with pitched and vaulted roofs with stepped articulation towards sensitive areas. Key design features included:

- ancillary and welfare rooms placed to the front of the site to create a lower built form;
- vaulted roofs for the back elements containing the ventilation units to create further massing distinction and suggest a barn like architecture;
- roofs stepped and lowered towards the Standing Stone and homestead with holiday homes to create visual articulation;
- pitched roofs with a channel feature in the middle and panelling along the gable end with wood-effect panels or metal sheets;
- wall massing broken with fenestration and panelling in wood-effect panels, formed concrete, metal, brick or slate waste;
- louvres and panels along facade visible from homestead to suggest a barn style façade; and
- panelling with wood-effect panels, formed concrete or metal with muted tones to break up massing and suggest barn style architecture.

8.7.25 Option three explored further articulation of varied roof forms and massing. Key design features include:

- ancillary and welfare rooms placed to the front of the site to create a lower built form. Potential for a more domestic homestead style facade treatment with wood-effect panels and slate-effect roofs;
- smaller fan unit room stepped higher with clerestory windows along the roof to give a distinct identity and more natural light internally. Panelling with wood-effect panels or metal along roof line;
- the fan room as the highest mass with roofs stepping down towards the Standing Stone and homestead;
- low rise pitched roofs along the back elements, stepped for additional articulation;
- additional fenestration and architecturally enhanced louvres to break up the façades; and
- the front roofs could be of slate-effect panels while higher roofs could be metal sheets with muted grey or green colour.

8.7.26 Option four explored a curved roof example. This option had an interesting profile and blended into the mountainous background. However, curved roofs are not common in the agricultural context of the area and there were cost and maintenance concerns with the option. It is likely to appear incongruous in the local context, presenting a very modern form of roof design.

Building Form Preferred Option

8.7.27 Following stakeholder feedback in August 2017 a revised version of Options one and three emerged as the preferred design approach with the following key design principles:

- the building volume would not exceed 9300 m^3 with a maximum building height of 11 m;
- ancillary and welfare rooms placed to the front of the site to create a lower built form towards the front facade;
- access rooms and smaller ventilation units may be placed on a mezzanine level to create a higher built form. There are potential opportunities to further reduce massing by removing or reducing the mezzanine level and increasing the footprint within the constraints imposed by the parameters being sought in the DCO;
- the fan room placed at the back of the site as the tallest mass;

- the higher elements have pitched roofs that step down towards the Standing Stone and the homestead;
- metal standing seam roof with muted grey or green colour suggested;
- wall massing broken into sections where the lower section could be in visually heavy stone finishes or concrete, while the upper section could be corrugated metal, concrete panels, wood-effect panels or striated cladding in muted green or grey tones. Additional recesses could be provided to enhance visual articulation.

8.7.28 The Design Guide (**Document 7.19**) provides examples of the materials pallet and indicative colour pallet to be used for the built form, access and surface treatments and fencing

Landscape Design Approach

8.7.29 Landscaping is proposed around the THH/CSEC operational compound within the site boundary perimeter fence (outwith the security fencing), the indicative area within which landscape planting would be located is illustrated on DCO_DE/PS/09_05 Sheet 5 of 8 (**Document 4.13**). The indicative landscaping proposals for this area are shown on Environmental Statement Figure 7.15 (**Document 5.7.1.15**).

8.7.30 The landscape mitigation proposals would include the use of native species of local provenance, where available.

8.7.31 The landscape setting and design approach to the Tŷ Fodol THH/CSEC is as follows:

- proposed planting and mounding would provide additional screening from properties at Fodol and Garth Fawr;
- proposed new hedgerow, crawiau and slate pillar fencing to reinstate northern boundary edge;
- the attenuation pond would be designed as a part of the landscape setting of the site;
- land boundary fronting Fodolydd Lane could be reinstated with Crawiau to reinforce local landscape character;
- planting mixes to comprise largely indigenous species with both deciduous and evergreen components to provide year-round screening and biodiversity benefits;

- locally appropriate wild flower seeding mixes to be used to provide interest and biodiversity benefits for invertebrates.

Design

8.7.32 A THH/CSEC site layout is illustrated on Design Plan DCO_DE/PS/09_06 Sheet 6 of 8 (**Document 4.13**). The indicative final arrangement for Tŷ Fodol operational compound are illustrated in DCO_DE/PS/09_08 Sheet 8 of 8 (**Document 4.13**). A visualisation of the Tŷ Fodol THH/CSEC is provided in Figure 3. The illustrative footprint and layout has been determined by the operational requirements as well as environmental and safety considerations.

8.7.33 The Tŷ Fodol site (operational compound and landscaping) would occupy an area of 34,200 sq m which is inclusive of the permanent access track. The operational compound would occupy an area of approximately 8,640 sq m. The platform level at Tŷ Fodol would be 82.16 m AOD.

8.7.34 The THH/CSEC operational compound would be surrounded by a 2.4 m mesh or palisade security fence topped with an electric pulse fence to a height of 3.4 m, this is illustrated on Design Plans DCO_DE/PS/09_07 Sheet 7 of 8 and Design Plan DCO_DE/PS/09_08 Sheet 8 of 8 (**Document 4.13**).

8.7.35 The area inside of the security fence would comprise two gantries which would be 14.9 m high, CSE equipment which provides the transition from an OHL to underground cable, DNO supply and compound, portable relay room, THH which is required to provide maintenance access to the tunnel and tunnel shafts, cable troughts, 400 kV underground cables, firefighting water tank if required and internal vehicular access.

8.7.36 The attenuation ponds, water storage tank and oil separator would be located within the site boundary perimeter fence but beyond the security fence operational compound). The site layout includes an area for saline water treatment, if required, this is illustrated on Design Plan DCO_DE/PS/09 Sheet 6 of 8 (**Document 4.13**).

8.7.37 The above ground elements of the THH/CSEC would have formal drainage systems, with runoff from impermeable surfaces draining to an attenuation pond prior to discharge to nearby watercourses at the outfall locations that will be retained from the construction phase. Saline treatment areas would be provided for shaft and tunnel dewatering, if required (See **Document 4.13**, DCO_DE/PS/09 SHEET 6 OF 8). An outline drainage strategy for the THH/CSEC is provided in the FCA (**Document 5.12.2.3**). The outline drainage strategy allows for the attenuation of runoff to QBAR greenfield rates for all events up to the 1% AEP event, including an appropriate allowance for climate change. Furthermore, a detailed drainage design that is consistent

with the outline strategy will be produced as part of the Drainage Management Plan (DMP) for the Proposed Development that is secured through Requirement 7 of the draft DCO (**Document 2.1**).

8.7.38 There would be a medium risk of internal surface water flooding if there were no robust on-site water management systems and site discharge restrictions in place at the Tŷ Fodol site.

8.7.39 The FCA (**Document 5.12.2.3**) has demonstrated that the site is located in DAM Flood Zone A and as a result neither the Sequential Test nor the Exception Test is applicable. It has also demonstrated that the site would be adequately protected from flooding, and would not increase flood risk elsewhere).

8.7.40 The THH building volume would not exceed 9300 m^3 with a maximum building height of 11 m. Details of the building, including their design, external appearance, colour and surface finish would be in general accordance with the key design principles set out in the Design Guide (**Document 7.19**) as secured by Requirement 4 in the draft DCO (**Document 2.1**).

8.7.41 Under normal operational conditions the THH/CSEC would not be lit. Lighting would be required during planned or unplanned maintenance activities. Lighting would be required to allow the safe movement of vehicles and pedestrians at night within the operational boundary. The minimum exterior lighting requirements would be:

- Maintained average illuminance: 6.0 lux; and
- Maintained minimum point illuminance: 2.5 lux.

8.7.42 These requirements apply to all perimeter fencing and gates and permanent access roads, verges, footpaths, designated walkways and areas occupied by plant or other equipment contained by the operational fence line.

8.7.43 Additional portable lighting would be used for both planned and unplanned maintenance activities. This would be brought to site when required and removed on completion of the maintenance activity.

8.7.44 Landscaping is proposed around the operational compound within the site boundary perimeter fence; the indicative area within which landscape planting would be located is illustrated on DCO_DE/PS/09 Sheet 5 of 8 (**Document 4.13**). The indicative landscaping proposals for this area are shown on Environmental Statement Figure 7.15 (**Document 5.7.1.15**) and are summarised in the Design Guide (**Document 7.19**). The mitigation planting is secured by Requirement 9 and 10 of the draft DCO (**Document 2.1**).

Access

8.7.45 The Tŷ Fodol THH/CSEC would be served by a new permanent 4 m wide access road to provide permanent access for National Grid (and its representatives) to undertake maintenance and repair works. Access would be taken directly from the public highway at Ffordd Fodolydd Lane (Link 30) which connects with the B4547. The new junction with Ffordd Fodolydd (**Document 5.13.1.3**) would allow appropriate visibility splays. The location of the permanent access track is shown on Design Plan DCO_DE/PS/09_05 Sheet 5 of 8 and Design Plan DCO_DE/PS/09_06 Sheet 6 of 8 (**Document 4.13**).

8.7.46 In addition to the permanent access track to Tŷ Fodol THH/CSEC shown on Design Plan DCO_DE/PS/09_05 Sheet 5 of 8 and Design Plan DCO_DE/PS/09_06 Sheet 6 of 8 (**Document 4.13**) permanent access rights would be maintained over the temporary access track from bellmouth F4 as illustrated on Environmental Statement Figure 4.1 Construction Plans (**Document 5.4.1.1**). These rights would be required to access the THH/CSEC for a 1 in 40 year maintenance or unplanned event. Should this access be required it may be possible to use a temporary access track and the land would be reinstated on completion of the works.

8.7.47 Details (design and layout) of the permanent highway access arrangements will be secured by Requirements 17 of the draft DCO (**Document 2.1**), which requires submissions to be approved by the local planning authority.

8.7.48 Access to the operational compound would be controlled by a 3.6 m wide 5 bar lockable metal field gate. Given the nature of the infrastructure, no public access would be permitted.

9 Design of the Substation Works

9.1 INTRODUCTION

9.1.1 In order to facilitate the new connection, work would be required to extend the existing compound fence line at Wylfa Substation and extend Pentir Substation.

9.2 WYLFA

Existing Site Context

9.2.1 Wylfa Substation is an existing high voltage transmission network substation owned and operated by National Grid, located adjacent to the existing Wylfa Nuclear Power Station.

Design

9.2.2 The modification of the fence line would extend the substation compound by 508 sq m. Items of existing equipment would need to be removed including two gantries, two Super Grid Transformers (SGT) transformer bunds, redundant equipment in the former SGT bays and ancillary equipment such as ducts, power and signalling cables. New equipment would be installed within the existing site boundary including gantries, voltage transformers and post insulators.

Parameters

9.2.3 The parameter plan within which the modified equipment would be located is shown on Design Plan DCO_DE/PS/01_01 Sheet 1 of 10 and the proposed layout is shown on Design Plan DCO_DE/PS/01_02 Sheet 2 of 10 (**Document 4.13**). The proposed elevations are shown on Design Plan DCO_DE/PS/01_03 Sheet 3 of 10 (**Document 4.13**).

Access

9.2.4 An existing access currently serves the site. The works proposed at Wylfa would not require any modifications to the existing highway access.

9.3 PENTIR

Existing Site Context

9.3.1 Pentir Substation is an existing high voltage transmission network substation owned and operated by National Grid.

9.3.2 The Pentir Reporting Centre is located west of the site and is a current site office for National Grid. An access road off the B4547 is the key access into the site. The site is currently enclosed by woodland cover which provides visual screening.

Design

9.3.3 As part of the Proposed Development, an extension is required at Pentir Substation. The substation would be extended to the north-west, south-east and to the north-east with a total extension area of approximately 40,000 sq m, to accommodate the additional equipment required for the new connection.

9.3.4 The extension requires items of existing equipment to be removed including circuit breakers, disconnectors, earth switches a gantry and ancillary equipment such as ducts, power and signalling cables. New equipment would be installed as set out in paragraph 9.3.13.

9.3.5 The indicative layout on which is subject to the parameters is shown on Design Plan DCO_DE/PS/01_05 Sheet 5 of 10 (**Document 4.13**) and the proposed elevations are shown on Design Plan DCO_DE/PS/01_06 Sheet 6 of 10 Plans (**Document 4.13**).). A visualisation of Pentir is provided in Figure 4.

9.3.6 A detailed drainage design for the Pentir Substation extension will be provided as part of the DMP which is secured through Requirement 7 of the draft DCO (Document 2.1). The DMP will be provide details of the proposed drainage design for the permanent extension areas. Runoff rates will be limited used SuDS techniques (infiltration and/or attenuation to be confirmed) to greenfield QBAR rates for all storm events up to the 1% AEP plus climate change event. In line with the approach set out in FCA Volume 1, section 5.3 (**Document 5.12.2.2**), climate change allowances of 5% and 20% will be applied to extreme rainfall for the construction and operational phase drainage designs respectively. Hydraulic modelling will be used to accurately estimate attenuation requirements and to demonstrate that the proposed drainage designs are effective in limiting discharges to greenfield rates.

9.3.7 There is a low risk of surface water and groundwater flooding to the southwest and south of the existing substation.

9.3.8 The FCA (Document 5.12.2.2) confirmed that the substation extension is located in DAM Flood Zone A. As a result, neither the Sequential Test nor the Exception Test is applicable. . It has also demonstrated that the extension to Pentir Substation would be adequately protected from flooding during the construction and operational phases, and would not increase flood risk elsewhere.

Parameters

9.3.9 Design Plan DCO_DE/PS/09_04 Sheet 4 of 10 (**Document 4.13**) shows the maximum parameters within which Pentir Substation extension would be developed.

Technical Design

9.3.10 Pentir Substation is an existing high voltage transmission network substation owned and operated by National Grid. Substations are a method of controlling power flows and voltages across the transmission system and between the transmission and distribution systems.

9.3.11 As part of the Proposed Development, the existing substation is to be extended to the north-west, south-east and to the north-east to facilitate the transmission of additional generation over the high voltage transmission network.

9.3.12 The design of the extension is largely driven by functional requirements. The proposed electrical equipment is largely installed outdoors, on a levelled development site. Opportunities to vary the siting and spacing of equipment across the site are extremely limited. The live equipment needs to be enclosed by effective security fencing, which also encloses internal access roads.

9.3.13 The following is a list of additional equipment types being installed as part of the extension:

- circuit breaker: interrupts power flow. Materials: mixture of metal body and silicone/porcelain insulators;
- post insulators: support HV conductors to keep them away from the earth. Typically porcelain insulators above a steel structure;

- cable sealing ends (400 kV): interface between air insulated conductor (busbar/OHL conductor) and underground cables, one required per cable. Typically a silicone insulator above a steel structure;
- disconnector (400 kV): Capable of disconnecting the line from the substation (safety precautions). Materials: mixture of metal body and silicone or porcelain insulators;
- earth switch/post insulator (400 kV): To apply safety precautions for work on this equipment and supports HV conductor to keep it away from earth. Typically porcelain insulator above a steel structure;
- current and voltage transformers (400 kV): Provide measurements of voltage and current for use in the protection and control of the Transmission Network. Material: mixture of metal body and silicone or porcelain insulators;
- full line tension gantry and line landing gantry (400 kV): The overhead line conductors terminate on this structure. Materials: Steel;
- shunt reactor (400 kV) (this is will placed within the existing boundary of the substation. The parameter within which the shunt reactor could be located is shown on Design Plan DCO_DE/PS/01_04 Sheet 4 of 10 (**Document 4.13**)): shunt reactors are used to control the voltage on the Transmission Network within licence limits. Materials: Steel;
- security fencing: The security fencing is a 2.4 m high galvanised steel palisade fence with a 4m high (from ground level) electric fence backing;
- substation roads: Tarmac/asphalt surface. Required to move plant and persons around the site and to access equipment;
- substation surfacing: The substation surfacing is stone chippings; and
- ancillary plant rooms/relay rooms: These house the protection and control, low voltage power and signalling equipment required to operate the substation. Material: prefabricated steel or brick.

Landscape Design Approach

9.3.14 After completion of the works at the substation, a landscape mitigation scheme would be implemented which includes the following:

- land to the east of the southern extension would be raised to provide partial screening of the site when viewed from the minor public road and property to the south-east;

- areas of woodland retained around the substation would be brought into National Grid ownership to secure the existing screening these afford;
- woodland areas removed to facilitate construction (e.g. construction accesses) would be reinstated;
- new woodland planting to the south-east to replace the vegetation lost and restore the screening of the substation, particularly important for those more elevated residential areas to the south which have views towards the substation;
- new woodland planting to the north to reinforce the existing screening belt and provide replacement of vegetation removed during construction of the proposed 400 kV overhead line; and
- new boundary treatments along the minor road to the north including the introduction of hedgerow planting and fencing treatments such as slate pillar fencing.

9.3.15 The indicative landscaping proposals for Pentir Substation are shown on Environmental Statement Figure 7.16 (**Document 5.7.1.16**).

Access

9.3.16 An existing access currently serves the site. The works proposed at Pentir would not require any modifications to the existing highway access.

10 Conclusion

10.1.1 Following the request for a grid connection for Wylfa Newydd Power Station, National Grid identified that a second connection was required between Wylfa Substation and the transmission system on the mainland. Further details about the need for this second connection are set out in full in the Project Need Case (**Document 7.1**). After an assessment of the strategic options it was concluded that the preferred option would be based on a new 400 kV OHL between Wylfa and Pentir Substations.

10.1.2 National Planning Statement 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.

10.1.3 Part 4.5.1 of EN-1 details the criteria for 'good design' for energy infrastructure and paragraph 4.5.2 recognises the importance of good design in addressing potential environmental effects. The Secretary of State therefore needs to be satisfied that energy infrastructure developments are sustainable and, have regard to regulatory and other constraints and 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.

10.1.4 National Grid has developed and defined the Proposed Development ensuring it has been informed by technical, financial, environmental and socio-economic considerations. The Proposed Development has been in development since 2012 and has evolved in an iterative manner, informed by the above considerations and consultation with key stakeholders, local residents and land owners.

10.1.5 As identified in paragraph 4.5.3 of EN-1, 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 that minimise potential adverse environmental and socio-economic impacts.

10.1.6 In evaluating options for the Proposed Development e.g. route alignment and THH/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 including environmental and socio-economic issues.

10.1.7 The alignment of the OHL has been identified through routeing 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 stages in order to balance landscape and visual effects with technical and efficiency requirements. The design philosophy adopted for the Proposed Development adheres to the requirements 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.

10.1.8 A large proportion of Anglesey's rural coastline has been designated as an Area of Outstanding Natural Beauty (AONB). In order to reduce the landscape and visual impacts on the AONB, National Grid is proposing to place the 400 kV connection in a tunnel through this designation and across the Menai Strait, avoiding the routeing of an OHL within this sensitive area.

10.1.9 In the context of technical requirements, National Grid has sought to identify the most appropriate locations for the new THH/CSEC elements of the Proposed Development. The identification of appropriate locations has been informed by guidelines on the design and siting of substations. The THH/CSECs design would be in general accordance with the design principles set out in the Design Guide (**Document 7.19**) as secured by Requirement 4 in the draft DCO (**Document 2.1**). These Design Principles have been subject to consultation, and the preferred option has been developed to balance the views of consultees with the necessary technical, safety and efficiency requirements.

10.1.10 The landscape mitigation proposals would include the use of native species of local provenance, where available.

10.1.11 The infrastructure has been designed to take into account climate change and to ensure that it would be resilient over its anticipated operational lifespan. The design of the THH/CSECs and the Pentir Substation extension have all been subject to FCA, which has demonstrated that the sites would be adequately protected from flooding, and would not increase flood risk elsewhere. National Grid has also designed the THH/CSECs and the Pentir Substation extension to ensure that greenfield run-off rates can be achieved.

10.1.12 It is concluded that National Grid has designed the Proposed Development to be adaptable and durable to climate change. National Grid, through the application of the guidelines on the siting and design of infrastructure is able to demonstrate that the principles of good design have been applied in terms of siting relative to existing landscape character, landform and vegetation.

10.1.13 It is concluded that the Proposed Development satisfies the Good Design criteria identified within NPS EN-1 and EN-5.

References

Ref 1 Overarching National Policy Statement (NPS) for Energy (EN-1) Department for Energy and Climate Change (DECC), 2011. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf

Ref 2 PINS Advice Note 6 (Preparation and Submission of Application Documents). Available at : https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/05/Advice-note-6-version-71.pdf

Ref 3 NPS for Electricity Networks Infrastructure (EN-5) Department for Energy and Climate Change (DECC), 2011. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47858/1942-national-policy-statement-electricity-networks.pdf

Ref 4 Technical Advice Note (TAN) 12 Guidance on Design and Access Statement, Welsh Government March 2016. Available at: https://gov.wales/docs/desh/publications/160504-technical-advice-note-12-en.pdf

Ref 5 Design and Access Statements in Wales, Welsh Government April 2017. Available at: https://gov.wales/docs/desh/publications/171009design-and-access-statements-guidance-en.pdf

Ref 6 Planning Inspectorates Advice Note 9, Rochdale Envelope. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/05/Advice-note-9.-Rochdale-envelope-web.pdf

Ref 7 Electricity Act 1989. Available at: http://www.legislation.gov.uk/ukpga/1989/29/contents

Ref 8 National Grid plc: National Grid's commitments when undertaking works in the UK – Our Stakeholder Community and Amenity Policy: February 2010. Available at: http://www.nationalgrid.com/NR/rdonlyres/21448661-909B-428D-86F0-2C4B9554C30E/39991/SCADocument6_2_Final_24_2_10.pdf

Ref 9 Paragraph 6 of Licence Condition C8 sets out exceptions where National Grid is not obliged to make an offer (e.g. where doing so would put it in breach of certain other contracts or regulations).

Ref 10 NETS Security and Quality of Supply Standard Issue 2.1 – 07 March 2011.

Ref 11 Climate Change Act 2008. Available at: http://www.legislation.gov.uk/ukpga/2008/27/contents

Ref 12 Department of Energy and Climate Change, National Policy Statement for Nuclear Power Generation (EN-6) July 2011. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47859/2009-nps-for-nuclear-volumeI.pdf

Ref 13 HM Government: The UK Low Carbon Transition Plan - National Strategy for Climate and Energy: July 2009

Ref 14 Annual Energy Statements provide a yearly review of government progress toward implementing UK energy policy; the most recent annual statement was issued in October 2014. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/371388/43586_Cm_8945_print_ready.pdf.

Ref 15 HM Government: Meeting the Energy Challenge - A White Paper on Energy: May 2007.

Ref 16 The Planning Act 2008. Available at: http://infrastructure.independent.gov.uk/wp-content/uploads/2009/08/ukpga_20080029_en.pdf

Ref 17 Welsh Government, Planning Policy Wales (PPW) (Edition 9, November 2016). Available at: https://gov.wales/docs/desh/publications/161117planning-policy-wales-edition-9-en.pdf

Ref 18 Anglesey and Gwynedd Joint Local Development Plan 2011 - 2026 (31 July, 2017). Available at: https://www.gwynedd.llyw.cymru/en/Council/Documents---Council/Strategies-and-policies/Environment-and-planning/Planning-policy/Anglesey-and-Gwynedd-Joint-Local-Development-Plan-Written-Statement.pdf

Ref 19 National Grid plc: Our Approach to the Design and Routeing of New Electricity Transmission Lines: August 2012. Available at: http://www2.nationalgrid.com/UK/In-your-area/Community-Engagement/

Ref 20 National Grid plc: The National Grid Company plc and new high voltage transmission lines – guidelines for line routeing (the Holford Rules) and undergrounding: March 2003.

Ref 21 National Grid plc: NGC substations and the environment – guidelines on siting and design: March 2013.

Ref 22 North Wales Connection Project Preliminary Environmental Information Report (PEIR). Available at: http://northwalesconnection.com/current-documents-and-maps.aspx

Ref 23 National Grid (2016). Climate adaptation reporting second round: National Grid. Available at: https://www.gov.uk/government/publications/climate-adaptation-reporting-second-round-national-grid

Figures

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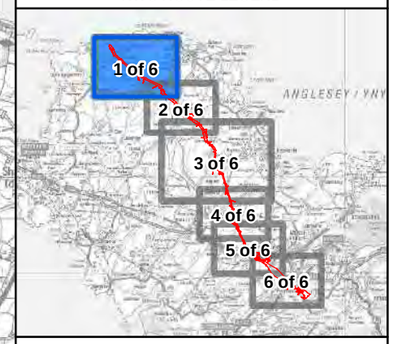
SECTION A
SECTION B

NWC ROUTE LEGEND



LEGEND

- ORDER LIMITS
- ABOVE GROUND LIMITS OF DEVIATION (LOD)
- BELOW GROUND LOD
- SECTION CUTLINES
- NEW GANTRY (FULL LINE TENSION)
- NEW GANTRY
- GANTRY TO BE REMOVED
- NEW LATTICE PYLON
- NEW LOW HEIGHT LATTICE PYLON
- EXISTING LATTICE PYLON TO BE REMOVED
- EXISTING LATTICE PYLON TO BE MODIFIED
- EXISTING LATTICE PYLON NOT AFFECTED
- NEW OVERHEAD LINE
- EXISTING OVERHEAD LINE TO BE REMOVED
- EXISTING OVERHEAD LINE TO BE MODIFIED
- EXISTING OVERHEAD LINE NOT AFFECTED
- AREA WITHIN WHICH TUNNEL HEAD HOUSE AND CABLE SEALING END COMPOUND WILL BE LOCATED
- PROPOSED SUBSTATION EXTENSION FOOTPRINT
- EXISTING 132KV OUTDOOR SUBSTATION
- EXISTING NATIONAL GRID 400KV SUBSTATION FOOTPRINT

Rev	Date	Description	GIS	Chk	App
A	24/07/2018	DESIGN AND ACCESS STATEMENT	JB	JF	CC

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Scheme: NORTH WALES CONNECTION PROJECT

Document Number: 7.16

Document Title: FIGURE 1 PROPOSED DEVELOPMENT SECTION A

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JB	24/07/2018	JF	24/07/2018	CC	24/07/2018

Document Type:	Scale:	Format:	Sheets:	Rev:
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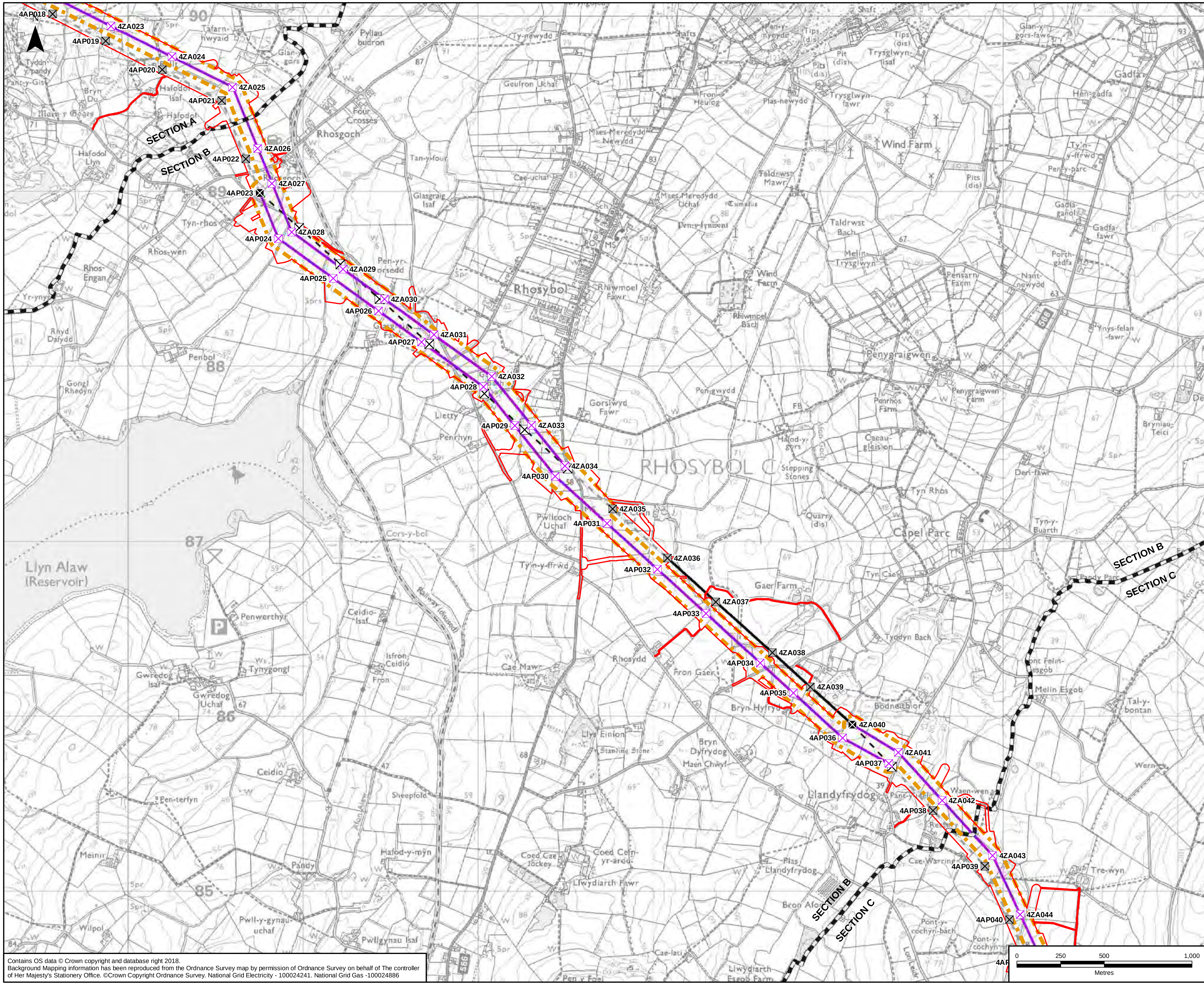

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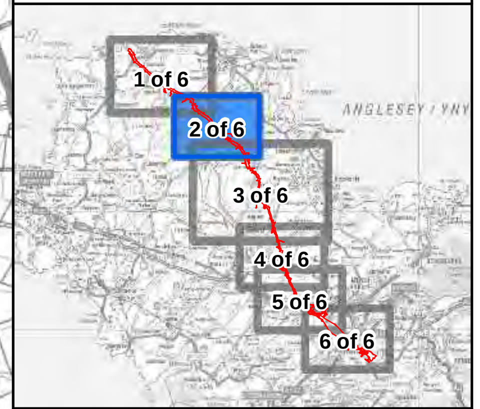

LEGEND

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- EXISTING NATIONAL GRID 400KV SUBSTATION FOOTPRINT

Rev	Date	Description	GIS	Chk	App
A	24/07/2018	DESIGN AND ACCESS STATEMENT	JB	JF	CC

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Scheme: NORTH WALES CONNECTION PROJECT

Document Number: 7.16

Document Title: FIGURE 1 PROPOSED DEVELOPMENT SECTION B

Creator:	Date:	Checker:	Date:	Approver:	Date:
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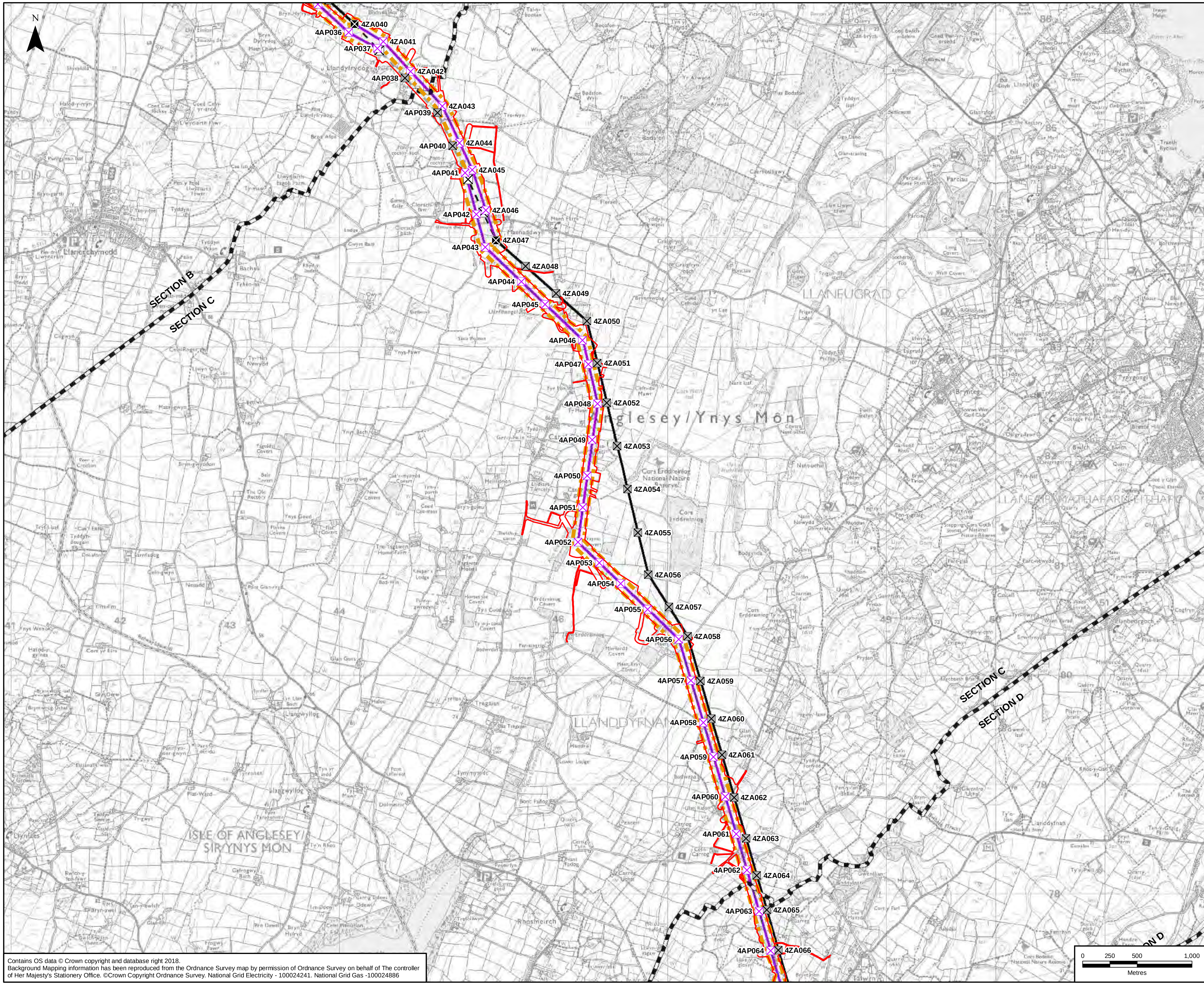

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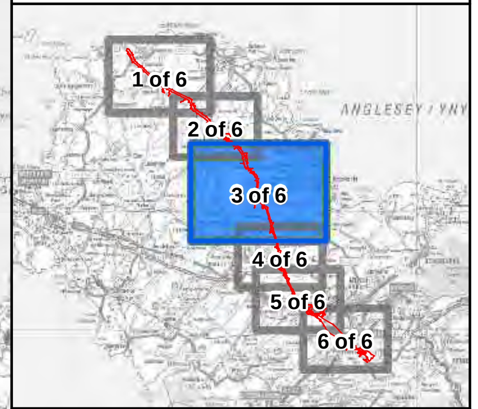

LEGEND

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- ABOVE GROUND LIMITS OF DEVIATION (LOD) - OPTION A
- BELOW GROUND LOD
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- NEW GANTRY (FULL LINE TENSION)
- NEW GANTRY
- GANTRY TO BE REMOVED
- NEW LATTICE PYLON
- NEW LOW HEIGHT LATTICE PYLON
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- PROPOSED SUBSTATION EXTENSION FOOTPRINT
- EXISTING 132KV OUTDOOR SUBSTATION
- EXISTING NATIONAL GRID 400KV SUBSTATION FOOTPRINT

Rev	Date	Description	GIS	Chk	App
A	24/07/2018	DESIGN AND ACCESS STATEMENT	JB	JF	CC

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Scheme: NORTH WALES CONNECTION PROJECT

Document Number: 7.16

Document Title: FIGURE 1
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SECTION C OPTION A

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JB	24/07/2018	JF	24/07/2018	CC	24/07/2018

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SECTION B
SECTION C
SECTION C
SECTION D

Llanfairpwllgwyngyll
Llanddyfnan
Isle of Anglesey/Ynys Môn

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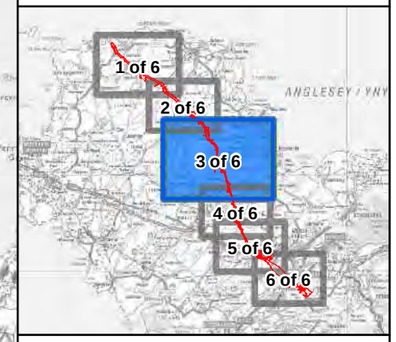

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- ABOVE GROUND LIMITS OF DEVIATION (LOD) - OPTION B
- BELOW GROUND LOD
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- NEW GANTRY
- GANTRY TO BE REMOVED
- NEW LATTICE PYLON
- NEW LOW HEIGHT LATTICE PYLON
- EXISTING LATTICE PYLON TO BE REMOVED
- EXISTING LATTICE PYLON TO BE MODIFIED
- EXISTING LATTICE PYLON NOT AFFECTED
- NEW OVERHEAD LINE
- EXISTING OVERHEAD LINE TO BE REMOVED
- EXISTING OVERHEAD LINE TO BE MODIFIED
- EXISTING OVERHEAD LINE NOT AFFECTED
- AREA WITHIN WHICH TUNNEL HEAD HOUSE AND CABLE SEALING END COMPOUND WILL BE LOCATED
- PROPOSED SUBSTATION EXTENSION FOOTPRINT
- EXISTING 132KV OUTDOOR SUBSTATION
- EXISTING NATIONAL GRID 400KV SUBSTATION FOOTPRINT

Rev	Date	Description	GIS	Chk	App
A	24/07/2018	DESIGN AND ACCESS STATEMENT	JB	JF	CC

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Scheme: NORTH WALES CONNECTION PROJECT

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Document Title: FIGURE 1
PROPOSED DEVELOPMENT
SECTION C OPTION B

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Rhosmeirch
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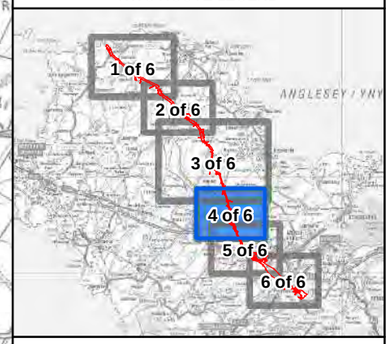
LLANGEFNI
Penmynydd



NWC ROUTE LEGEND

LEGEND

- ORDER LIMITS - OPTION A
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- BELOW GROUND LOD
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- NEW GANTRY (FULL LINE TENSION)
- NEW GANTRY
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Rev	Date	Description	GIS	Chk	App
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Scheme: NORTH WALES CONNECTION PROJECT

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SECTION D OPTION A

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SECTION E

LLANGEFNI
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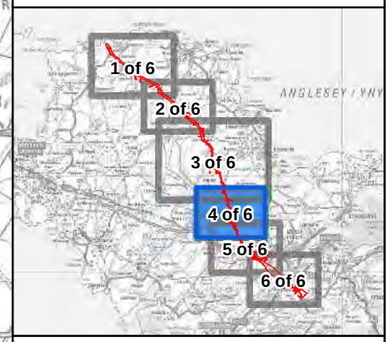
NWC ROUTE LEGEND



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- EXISTING NATIONAL GRID 400KV SUBSTATION FOOTPRINT

Rev	Date	Description	GIS	Chk	App
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Document Number: 7.16

Document Title: FIGURE 1
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SECTION D OPTION B

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SECTION D
SECTION E
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SECTION E
SECTION F

BRAINT TUNNEL HEAD HOUSE AND CABLE SEALING END COMPOUND

PENMYNYDD C
LLANFIHANGEL YSGEIFIOG
LLANDDANIEL FAB C

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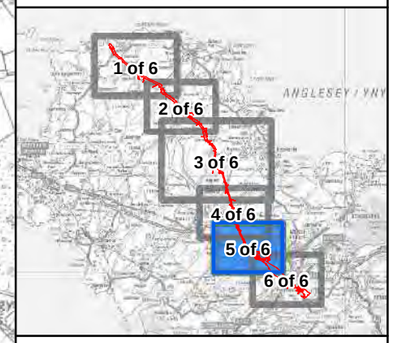
Metres

NWC ROUTE LEGEND



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- ORDER LIMITS
- ABOVE GROUND LIMITS OF DEVIATION (LOD)
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Document Title: FIGURE 1 PROPOSED DEVELOPMENT SECTION E

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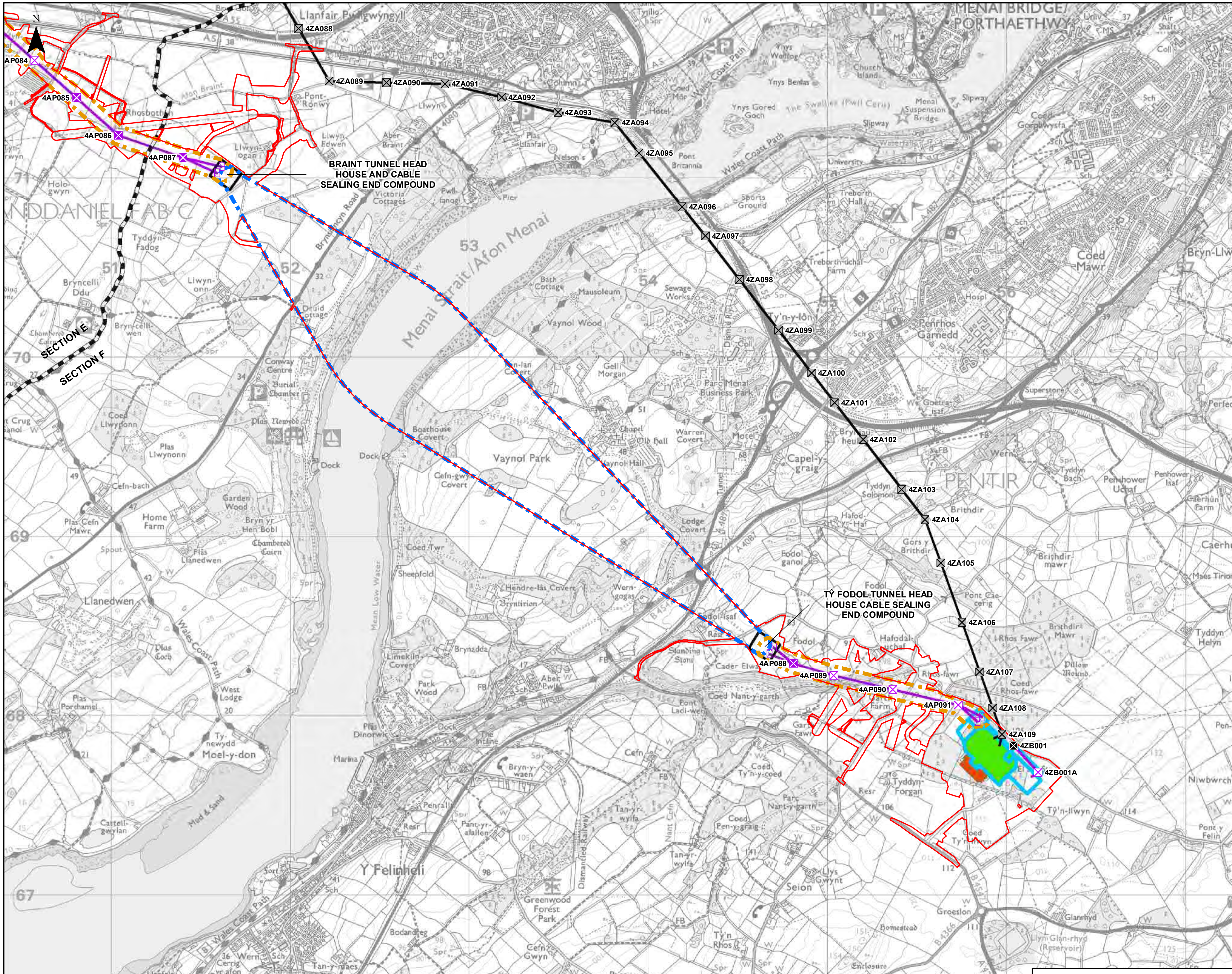

NWC ROUTE LEGEND

1 of 6
2 of 6
3 of 6
4 of 6
5 of 6
6 of 6

LEGEND

- ORDER LIMITS
- ABOVE GROUND LIMITS OF DEVIATION (LOD)
- BELOW GROUND LOD
- SECTION CUTLINES
- NEW GANTRY (FULL LINE TENSION)
- NEW GANTRY
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Rev	Date	Description	GIS	Chk	App
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Scheme: NORTH WALES CONNECTION PROJECT

Document Number: 7.16

Document Title: FIGURE 1 PROPOSED DEVELOPMENT SECTION F

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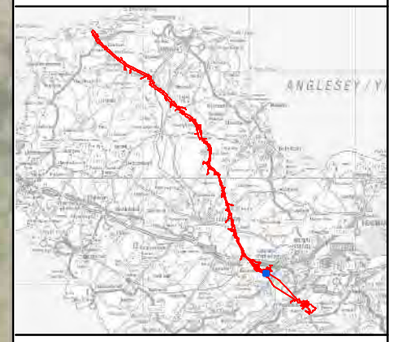

LEGEND

Proposed

- Low Maintenance Grass
- Wild-flower Planting
- Low Planting
- Woodland Planting
- Clawdd (Stone faced earth embankment with hedgerow)
- Tree Planting
- Attenuation Pond with Wetland Planting
- Saline Treatment Area
- Buildings
- Access Tracks
- Proposed Contours
- Reinstated to Pasture
- Proposed Overhead Line
- Proposed Electrical infrastructure
- Section Line

Existing

- Tree
- Existing Contours

Rev	Date	Description	GIS	Chk	App
A	30/08/2018	DESIGN AND ACCESS STATEMENT	JF	JK	CC

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Scheme: NORTH WALES CONNECTION PROJECT

Document Number: 7.16

Document Title:
FIGURE 2
VISUALISATION OF BRAINT TUNNEL HEAD HOUSE

Creator:	Date:	Checker:	Date:	Approver:	Date:
JF	30/08/2018	JK	30/08/2018	CC	30/08/2018

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Attenuation Pond

Tunnel Head House

Indicative Waste Water Storage

Indicative Saline Treatment Area

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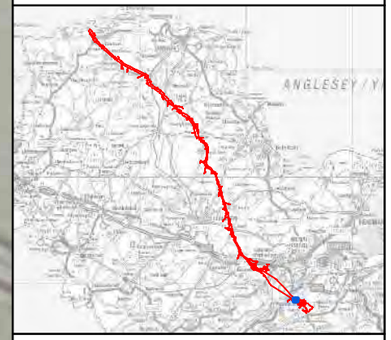
Metres

NWC ROUTE LEGEND



LEGEND

Proposed

- Low Maintenance Grass
- Wild-flower Planting
- Low Planting
- Woodland Planting
- Clawdd (stone faced earth embankment with hedgerow)
- Tree Planting
- Attenuation Pond with Wetland Planting
- Saline Treatment Area
- Buildings
- Access Tracks
- Proposed Contours
- Proposed Overhead Line
- Proposed Electrical Infrastructure
- Section Line

Existing

- Existing Contours

Rev	Date	Description	GIS	Chk	App
A	30/08/2018	DESIGN AND ACCESS STATEMENT	JF	JK	CC

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Scheme: NORTH WALES CONNECTION PROJECT

Document Number: 7.16

Document Title: FIGURE 3
VISUALISATION OF TY FODOL TUNNEL HEAD HOUSE

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Document Type:	Scale:	Format:	Sheets:	Rev:
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NWC ROUTE LEGEND

LEGEND

- Overhead Line
- Substation Extension
- Existing Substation
- Hedgerow/ Carwiau
- Proposed Woodland
- Existing Woodland
- Grass

Rev	Date	Description	GIS	Chk	App
A	30/08/2018	DESIGN AND ACCESS STATEMENT	JF	JK	CC

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Scheme: NORTH WALES CONNECTION PROJECT

Document Number: 7.16

Document Title: FIGURE 4
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JF	30/08/2018	JK	30/08/2018	CC	30/08/2018

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0 20 40 60 80 100
Metres

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