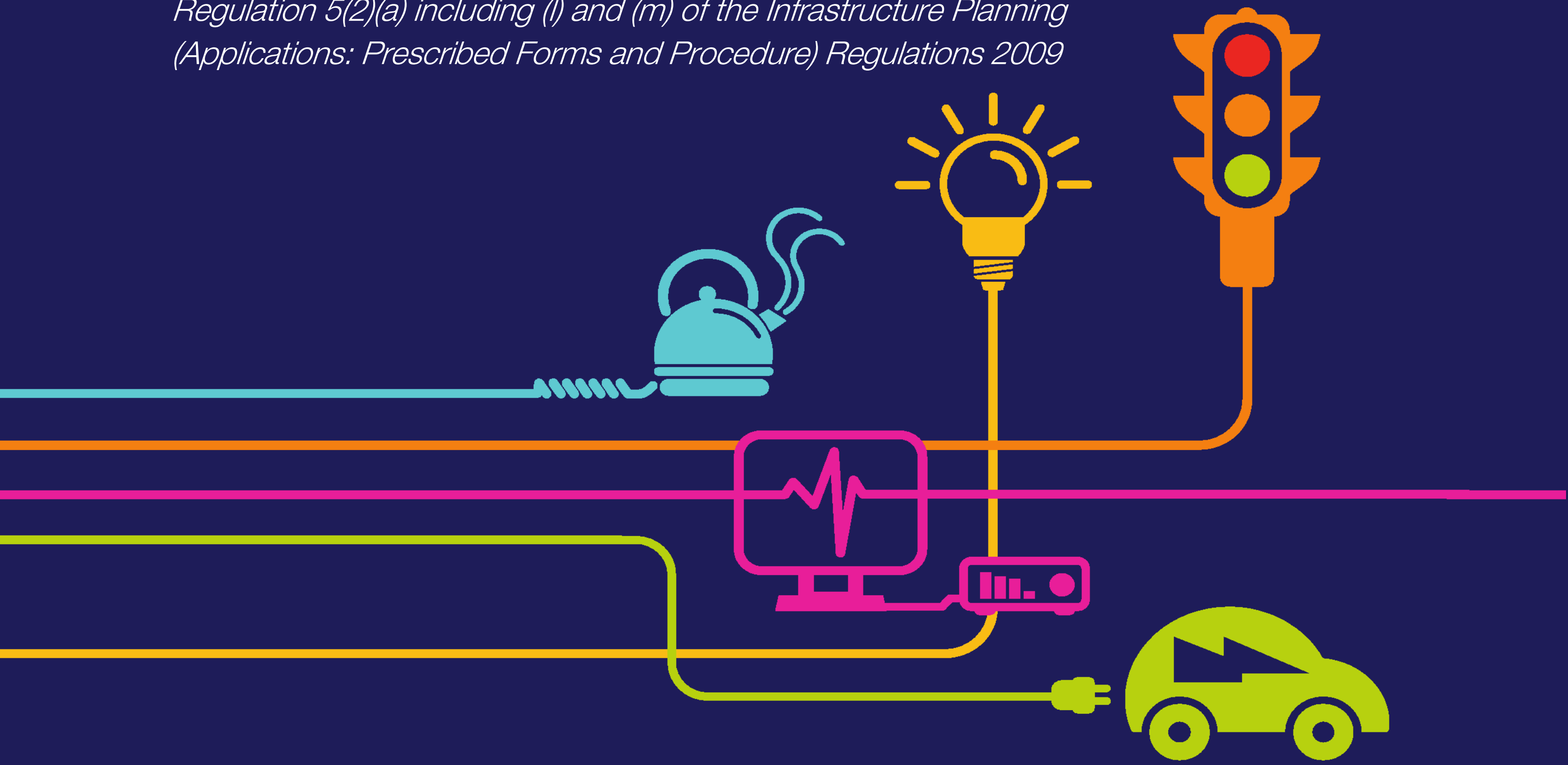
DOCUMENT 5.4

Environmental Statement Chapter 4

Construction, Operation, Maintenance and Decommissioning of the Proposed Development

National Grid (North Wales Connection Project)

Regulation 5(2)(a) including (l) and (m) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009



nationalgrid

North Wales Connection Project

Volume 5

Document 5.4 Chapter 4 Construction, Operation, Maintenance and Decommissioning of the Proposed Development

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1 Introduction

1.1 INTRODUCTION

1.1.1 This chapter provides information about how the Proposed Development would be constructed, how it would operate, any maintenance that may routinely be required and, if necessary, how it would be decommissioned if the connection were no longer needed.

1.1.2 Chapter 3 (**Document 5.3**) provides a description of the Proposed Development in terms of what infrastructure is proposed, where it would be located, what size it would be and its likely appearance.

1.1.3 This chapter is supported by Appendix 4.1 (**Document 5.4.2.1**) – Temporary Access Principles Note.

1.1.4 The following Figures and Plans should be referred to when reading this chapter:

- Figure 4.1 National Grid Construction Plans (**Document 5.4.1.1**);
- Figure 4.2 Third Part Construction Plans (**Document 5.4.1.2**);
- DCO_DE/PS/08_02 Sheet 2 of 4 (**Document 4.13**) – Illustrative Lattice Pylon Footprints;
- DCO_DE/PS/08_03 Sheet 3 of 4 (**Document 4.13**) – Illustrative Lattice Pylon Foundations;
- DCO_DE/PS/10_01 Sheet 1 of 3 (**Document 4.13**) – Illustrative Lattice Pylon Working Areas;
- DCO_DE/PS/10_02 Sheet 2 of 3 (**Document 4.13**) – Illustrative Lattice Pylon Conductor Pulling Positions;
- DCO_DE/PS/11)_01 Sheet 1 of 6 (**Document 4.13**) – Illustrative Bellmouth Layout;
- DCO_DE/PS/11_02 Sheet 2 of 6 (**Document 4.13**) – Illustrative Stone Access Road;

- DCO_DE/PS/11_03 Sheet 3 of 6 (**Document 4.13**) – Illustrative Interlocking Panel Access For Overhead Line Construction;
- DCO_DE/PS/11_04 Sheet 4 of 6 (**Document 4.13**) – Illustrative Culvert Construction Details;
- DCO_DE/PS/11_05 Sheet 5 of 6 (**Document 4.13**) – Illustrative Bridge Details for Overhead Line Construction;
- DCO_DE/PS/11_06 Sheet 6 of 6 (**Document 4.13**) – Illustrative Bridge Details for Tunnel Construction;
- DCO_DE/PS/12_01 Sheet 1 of 5 (**Document 4.13**) – Illustrative Overhead Line Construction Compound;
- DCO_DE/PS/12_02 Sheet 2 of 5 (**Document 4.13**) – Illustrative Tunnel and cable Sealing End Construction Compound – Braint;
- DCO_DE/PS/12_03 Sheet 3 of 5 (**Document 4.13**) – Illustrative Tunnel and cable Sealing End Construction Compound – Tŷ Fodol;
- DCO_DE/PS/12_04 Sheet 4 of 5 (**Document 4.13**) – Illustrative Substation Construction Compound – Wylfa; and
- DCO_DE/PS/12_04 Sheet 5 of 5 (**Document 4.13**) – Illustrative Substation Construction Compound – Pentir.

2 Construction

2.1 INTRODUCTION

2.1.1 This section describes how the various elements of the Proposed Development would be constructed.

2.2 CONTROL AND MANAGEMENT MEASURES

2.2.1 Control and management measures for the construction of the Proposed Development are set out in a series of management plans and strategies which would be in place prior to and during construction as appropriate. Some of the control and management measures contained within these documents would need take place prior to construction, where this is the case this is set out within the relevant management plan or strategy. These management plans and strategies are as follows::

- Construction Environmental Management Plan (CEMP) (**Document 7.4**);
- Outline Construction Traffic Management Plan (CTMP) (**Document 7.5);**
- Public Rights of Way Management Plan (**Document 7.6**);
- Biodiversity Mitigation Strategy (**Document 7.7**);
- Archaeological Strategy (**Document 7.8**);
- Noise and Vibration Management Plan (**Document 7.9**);
- Outline Soil Management Plan (**Document 7.10**);
- Outline Waste Management Plan (**Document 7.11**); and
- Outline Materials Management Plan (**Document 7.12**).

2.3 OVERHEAD LINE

2.3.1 This section sets out construction information related to the overhead line (OHL). It is the intention that the third party asset works (described in section 2.8 below) would be undertaken in advance of 400 kV OHL construction work. It is anticipated that these works would be undertaken by the relevant statutory undertaker for example the Distribution Network Operator (DNO) (in this case SP Manweb) or Open Reach; however National Grid would also have the rights to undertake this work if needed.

Construction Compounds

2.3.2 Construction activities would begin with the preparation and installation of the two construction compounds. This activity would take approximately 5 months for each Construction Compound.

Penmynydd Road Construction Compound

2.3.3 This compound is located on Anglesey, approximately 1.5 kilometres (km) to the east of Llangefni, centred on Grid Reference SH 482 751 and would be accessed off the B5420 (Penmynydd Road (Link 7)). This is illustrated on Works Plans DCO_D/WO/PS/03_A to DCO_D/WO/PS/04_A and DCO_D/WO/PS/03_B to DCO_D/WO/PS/04_B (**Document 4.4**) and Figure 4.1 Construction Plans (**Document 5.4.1.1**).

Pentir Construction Compound

2.3.4 This compound is located in Gwynedd directly south of Pentir Substation, centred on Grid Reference SH 559 674, and would be accessed off the B4547 (Link 19). This is illustrated on Works Plan DCO_F/WO/PS/05 (**Document 4.4**) and Figure 4.1 Construction Plans (**Document 5.4.1.1**).

Overhead Line Construction Compound Layout

2.3.5 A generic layout for a construction compound is illustrated on Design Plan DCO_DE/PS/12_01 Sheet 1 of 5 (**Document 4.13**) and typically includes the following:

- Security gate house;
- Plant and construction vehicle parking area;
- Site office parking area;
- Site offices and welfare facilities;

- Laydown area;
- Storage area;
- Wheel wash;
- Collection, storage and disposal of surface water, in addition to water from within the compound including grey and foul water;
- Soil bund;
- Spoil storage area;
- Diesel generator; and
- Fuel storage.

Overhead Line Construction Sequence

2.3.6 The construction of the 400 kV OHL would generally follow the sequence of events outlined below:

- Survey;
- Ground Investigation;
- Installation of bellmouths and creation of visibility splays;
- Installation of stock proof fencing and gates or equivalent;
- Topsoil stripping, temporary drainage installation where required;
- Installation of access tracks (including culverts and bridges) and demarcated pylon working areas;
- Installation of pylon foundations (pad and column, mini pile, tube pile or bespoke);
- Layout of steelwork in preparation for erection;
- Assembly (painting if required) and erection of steelwork;
- Installation of protection prior to stringing of conductors, including scaffolding;
- Installation of insulators;

- Establishment of machine sites for conductor stringing;
- Conductor stringing;
- Removal of construction equipment and reinstatement of ground and restoration of soils;
- Removal of access tracks and bellmouths; and
- Removal of construction compounds and reinstatement of ground.

2.3.7 Activities such as surveys, archaeological investigation, ground investigation, construction of bellmouths and access tracks could commence without the full construction compounds in place. Nominal office and welfare facilities would suffice for an initial period until the full construction compounds were available.

2.3.8 Vegetation clearance may be undertaken prior to or during any of the activities identified above, in accordance with ecological requirements as outlined within the CEMP (**Document 7.4**) and the Biodiversity Mitigation Strategy (**Document 7.7**).

2.3.9 The following sections provide summary information about the activities listed above.

Survey

2.3.10 Detailed topographical surveys would be undertaken in order to undertake the detailed design of the temporary and permanent works.

Ground Investigation

2.3.11 Ground investigation work, such as boreholes and trial pits, would be undertaken to ensure that ground conditions at pylon locations were suitable.

Installation of Bellmouths and Creation Visibility Splays

2.3.12 Where new accesses or widening of existing accesses from the public highway are required bellmouths would be installed; an illustrative bellmouth is shown on DCO_DE/PS/11_01 Sheet 1 of 6 (**Document 4.13**). The installation of bellmouths may require realignment of existing underground services and the creation of visibility splays to create a line of sight for the safe use of the junction. Within the visibility splay vegetation would need to be cut to a specified height or visual obstacles removed depending on local conditions, the speed rating of the road and whether traffic management was in place. The creation of visibility splays and the realignment of existing underground services would be undertaken within the Order Limits.

2.3.13 The locations of the proposed bellmouths are shown on the Access and Rights of Way Plans (**Document 4.5**) and the Construction Plans provided as Figure 4.1 (**Document 5.4.1.1**). Appendix 4.1, The Temporary Access Principles Note (**Document 5.4.2.1**) also provides a bellmouth schedule. Temporary bellmouths would be reinstated to the previous land use following completion of construction.

2.3.14 Each bellmouth and visibility splay would take approximately 10 days to install subject to the need to realign or protect any existing services encountered. The number of bellmouths in each section is as follows:

- Section A – 11;
- Section B – 11;
- Section C – 10;
- Section D – 4;
- Section E – 8; and
- Section F – 13.

<u>Installation of Stock Proof Fencing and Gates</u>

2.3.15 Once a new or widened access point had been created the proposed access tracks and pylon working areas would be fenced off using approximately 1.2 metre (m) high stock proof fencing or equivalent. Gates or equivalent would be incorporated into the fencing to maintain access to farmland where agreed and to maintain access to Public Rights of Way (PROWs) where agreed. The Access and Rights of Way Plans (**Document 4.5**) shows the PROWs that would be affected and which ones would be temporarily stopped up or diverted. The PROW Management Plan (**Document 7.6**) provides details of how these would be managed during construction.

Topsoil Stripping

2.3.16 The topsoil would be stripped from the access tracks and pylon working areas. The topsoil would be stored carefully to one side; typically topsoil would be stored in bunds approximately 4 m wide by 1.2 m high. Temporary drainage would be installed as required, with silt fences installed where required.

2.3.17 Topsoil stripping would be undertaken at a rate of approximately 50 m to 100 m per day per construction gang for access tracks and approximately three days per construction gang for a typical pylon working area.

Temporary and Permanent Drainage

2.3.18 Temporary drainage would be required during construction, to deal with rainfall and water encountered during excavation where appropriate. The drainage design would be prepared in accordance with a Drainage Management Plan (DMP), as set out in the CEMP (**Document 7.4**), which includes a variety of potential measures to address silt runoff. Construction sustainable drainage systems (SuDS) would be used if necessary and where appropriate to do so.

Installation of Access Tracks (including Culverts and Bridges) and Pylon Working Areas

2.3.19 The access tracks would typically be 4.5 m wide, and up to 9 m wide at passing places, which, coupled with the area for soil storage and drainage between the track and the fence line, would give a maximum swathe of 12 m. They would either be stone laid on a geotextile, or formed of interlocking panels, depending on ground conditions and the duration and type of use. Typical stone and interlocking panel access tracks are shown on Design Plan DCO_DE/PS/11_02 Sheet 2 of 6 and DCO_DE/PS/11_03 Sheet 3 of 6 (**Document 4.13**). The proposed location of access tracks and the pylon working areas are shown on Figure 4.1 (**Document 5.4.1.1**). Illustrative lattice pylon working areas are also shown on DCO_DE/PS/10_01 Sheet 1 of 3 (**Document 4.13**).

2.3.20 The installation of the access tracks would be undertaken at a rate of approximately 50 m per day per construction gang and a typical pylon working area would take one week per construction gang to install.

2.3.21 The stone access tracks would be constructed using secondary or primary aggregates. The total amount of aggregate material that would be needed for the construction of the stone access tracks (including bellmouths) and pylon working areas is approximately 450,000 tonnes (t). On completion of construction the access tracks would be removed and aggregates taken to an appropriate facility which could include recycling, or onward use, for example as secondary aggregate in the construction industry.

2.3.22 Plate 4.1 below illustrates a temporary stone access track and pylon working area.

Plate 4.1 temporary stone access track and pylon working area

2.3.23 Culvert installations would be required for temporary access tracks to cross ditches and watercourses. The size of the culvert would vary per crossing depending on the dimensions of the crossing, sensitivity and importance of the watercourse. Illustrative culvert construction details are shown on Design Plan DCO_DE/PS/11_06 Sheet 4 of 6 (**Document 4.13**).

2.3.24 To install a culvert, typically the banks are first strimmed at the proposed culvert location. Bunds would then be installed upstream and downstream to prevent water from entering the work site, water contained between the two bunds would be pumped downstream to clear the work area.

2.3.25 To maintain the flow of the watercourse during installation of the culvert, a pump is used to pump water from upstream to downstream, bypassing the work site.

2.3.26 The bottom of the ditch or watercourse would be excavated to the size of the proposed foundation and, if required lined with a geotextile separation membrane overlain by bedding material. If required, a geotextile separation membrane would be placed on top of the ditch banks, prior to backfilling. The culvert would then be installed and backfilling commenced.

2.3.27 The backfill would be laid to provide minimum cover over the culvert based on maximum loadings. A sand bag (or concrete bag) headwall and temporary fencing would subsequently be installed after which the bunds upstream and downstream would be removed and the over-pumping stopped to allow water to flow through the culvert.

2.3.28 The installation of culverts would take approximately two days per culvert.

2.3.29 Should culverts not be suitable for a particular crossing, due to either the sensitivity of the watercourse or engineering requirements, a temporary bridge would be installed. Illustrative bridge details for the 400 kV OHL construction are shown on Design Plan DCO_DE/PS/11_05 Sheet 5 of 6 (**Document 4.13**) and the locations of the bridge crossings are shown on the Figure 4.1 Construction Plans (**Document 5.4.1.1**). .

2.3.30 Temporary bridges would need to accommodate a 250 t capacity mobile crane and the temporary bridge support requirements would be assessed on a site by site basis. Most bridge crossings would be of a short span and flat deck construction; however Bailey style bridges may also be used. All bridges would be clear span and the foundations would be placed clear of the banks of the watercourse.

2.3.31 Once the foundations were in place the temporary bridge would be fitted. Although the installation method is dependent on the type of bridge being installed, a typical bridge would be delivered in sections. Each bridge component would be assembled on site and lifted into position by crane.

2.3.32 With the bridge in position, decking panels would be lifted and fixed into position.

2.3.33 The installation of a typical short span, flat deck bridge would take approximately four to five days. If concrete or if required piled bridge foundations were needed a further ten to fifteen days per bridge would be required. A list of the bridge crossings is set out in Table 4.1 below.

Table 4.1: Bridge Crossing Locations	
Crossing ID	Watercourse Name
Section A	
NG-RVX A/32	Foel Fawr
NG-RVX A/48	Maddanen
NG-RVX A/51	Unnamed
NG-RVXX A/70	Unnamed
Section B	
NG-RVX B/94	Glasgraig Fawr
NG-RVX B/134 NG-RVX B/135	Llandyfrydog
Section C	
NG-RVX C/129	Ynys Fawr
NG-RVX C/156	Erddreiniog
NG-RVX C/166	Clai
Section D	
NG-DRX D/192	Unnamed
NG-DRX D/193	Unnamed
NG-RVX D/196	Glyched
NG-RVX D/206	Ceint West
Section E	
NG-RVX E/229	Unnamed
NG-RVX E/241	Braint
Section F	
NG-RVX F/243	Braint Bifurcation

Table 4.1: Bridge Crossing Locations	
Crossing ID	Watercourse Name
NG-RVX F/256	Unnamed

Installation of Pylon Foundations (Pad and Column, Mini Pile or Tube Pile)

2.3.34 The foundations of the proposed pylons would either be pad and column, mini pile or tube pile (or bespoke if required). Typical drawings for these three types of foundations are illustrated on Design Plan DCO_DE/PS/08_03 Sheet 3 of 4 – Illustrative Lattice Pylon Foundations (**Document 4.13**). The selection of foundation type would depend upon the ground conditions encountered. Foundation types for gantries would also be dependent upon ground conditions encountered. Appendix 3.1 (**Document 5.3.2.1**) details the indicative foundation type for each of the new proposed pylons on the 4AP and 4ZA.

2.3.35 The installation of pad foundations would take approximately three weeks for each pylon (four pads). Mini pile or tube pile foundations would take approximately four weeks for each pylon.

2.3.36 For pylon locations where ground conditions did not easily permit the installation of pad and column, mini-pile or tube pile foundations, a bespoke foundation would be required. The design for each bespoke foundation would be subject to the ground conditions encountered.

Layout of Steelwork in Preparation for Erection

2.3.37 The steel work would be brought to each pylon working area and laid out in pre-constructed sections or in numbered parts prior to assembly and erection of the pylon.

2.3.38 Laying out of the steelwork would take approximately three days per pylon.

Erection of Steelwork

2.3.39 The numbered steelwork parts would be bolted together on the ground. The pylon would be assembled in sections beginning with each bottom leg section being fastened to the foundation steelwork.

The pylon would be erected using a mobile crane which would lift the assembled steelwork into position. Linesmen[1] would bolt together the pylon, climbing to each part to help guide the next section into place and fasten the bolts. The number of pylon sections required would vary according to the size of the pylon being built and the lifting capacity of the crane.

2.3.40 To lift the topmost sections of the taller pylons crane with a capacity of up to 250 t may be required for the reach and weight of the sections to be positioned into place. A smaller capacity crane could be used to lift pylon sections up to the limit of reach of the crane considering load to be lifted. Though in this instance the larger capacity crane would still be required to complete the pylon.

2.3.41 The average weight of steelwork within the existing pylons is approximately 25.5 t; it is likely that the proposed pylons would be of a similar or lower weight.

2.3.42 Plate 4.2 below illustrates the construction of a pylon in sections.

Plate 4.2 Pylon Construction

[1] A generic name given to operatives engaged on above ground OHL work.

Installation of Scaffolding Protection Prior to Stringing of Conductors

2.3.43 Temporary scaffolding and nets would be installed during construction where required as a safety measure to protect assets such as roads, railways, a water treatment works and distribution network OHLs (where not already moved underground) and could include hedgerows which would be crossed by the proposed 400 kV OHL. This is required to protect these features during conductor stringing from the accidental dropping of conductors and any of the associated equipment. The proposed scaffold working areas are shown on Figure 4.1 Construction Plans (**Document 5.4.1.1**). Temporary closures of some affected asset, such as roads, may be required during these works to install the protective netting, or indeed may be used instead of installing scaffolding.

2.3.44 The scaffolding would be transported to site using a lorry or tractor and trailer and assembled by hand either side of the feature being protected. Approximately 8 m^2 of scaffolding would be installed per day.

Installation of Insulators

2.3.45 The insulators would be fastened to the cross arms of the pylons, with running wheels hung from the end of the insulators to carry the pilot wires in preparation for installing the conductors. The installation of the insulators would take approximately two days per pylon.

Establishment of Machine Sites for Conductor Stringing

2.3.46 The machine sites for conductor stringing would normally be located within the pylon conductor pulling positions. A typical pylon conductor pulling position is illustrated on Design Plan DCO_DE/PS/10_02 Sheet 2 of 3 (**Document 4.13**) and the locations of the proposed conductor pulling positions are illustrated on Figure 4.1 (**Document 5.4.1.1**). The machine sites would be micro sited within pylon conductor pulling positions and would be sited on interlocking panels laid directly onto the ground surface reducing disturbance to the underlying soils. The machine sites would be sited within the pylon conductor pulling positions to avoid individual trees where possible however some trees within groups may need to be removed.

2.3.47 It would take approximately one day to establish the area to receive materials and equipment at each conductor stringing site.

Conductor Stringing

2.3.48 The wires (conductors) of the 400 kV OHL would be delivered to the pulling positions, illustrated on Figure 4.1 Construction Plans (**Document 5.4.1.1**), using lorries, or tractor and trailer. The conductors are wound onto large cable drums and, depending on the conductor type, each completed drum could weigh up to 8 t, although larger and heavier drums are possible depending on the supplier and the length of conductor. The drums containing the conductors would be delivered to the construction compound first, and would be distributed from there. Tractors with trailers and other smaller vehicles can also be used to transport the drums and other materials to site. Tension pylons are used where the OHL changes direction. The conductors are usually installed from tension pylon to tension pylon, often termed a ‘section’. A conductor pulling position would be established at each end of the section with a winching machine (‘winch’) and empty steel reels to accept pilot wires. At the other end of the section the full conductor drums would be arranged in close proximity to the tensioning machine (‘tensioner’).

2.3.49 Light pilot wires would be laid at ground level (and over temporary scaffolding protecting assets such as roads and railway lines) along the length of the section between the pulling positions (note that it is not typically necessary to clear hedgerows specifically for this activity, though some vegetation management could be required). The pilot wires would be lifted and fed through running wheels on the cross arms of all the pylons in the section, and then fed around the winch at the pulling position. The light pilot wires are used to pull through heavier, stronger pilot wires which are in turn used to pull conductors through from their drums. The tensioning machine would keep the wires off the ground and prevent the conductors running freely when the winch pulls the pilot wire. When the conductor is fully ‘run out’, it would be fastened at its finished tension and height above ground by a linesman working from platforms on the pylons which are suspended beneath the conductors. Additional fittings, such as spacers, if required and vibration dampers, would be fitted to the conductors.

2.3.50 To counter balance the out of balance loading at the tension pylons at the end of a conductor stringing section, it is normal to install temporary backstays or concrete blocks for safety of installation. The temporary backstays or concrete blocks are removed as the conductor stringing process starts on the next section. Temporary backstays might also be required at other locations such as connecting new conductor to existing conductor, temporary diversions and temporary spans.

2.3.51 Stringing the conductors would take approximately four weeks per section.

2.3.52 Where the existing earthwire is to be replaced with an earthwire containing optical fibres it may be possible to use the existing earthwire as the equivalent of the pilot wire during the installation.

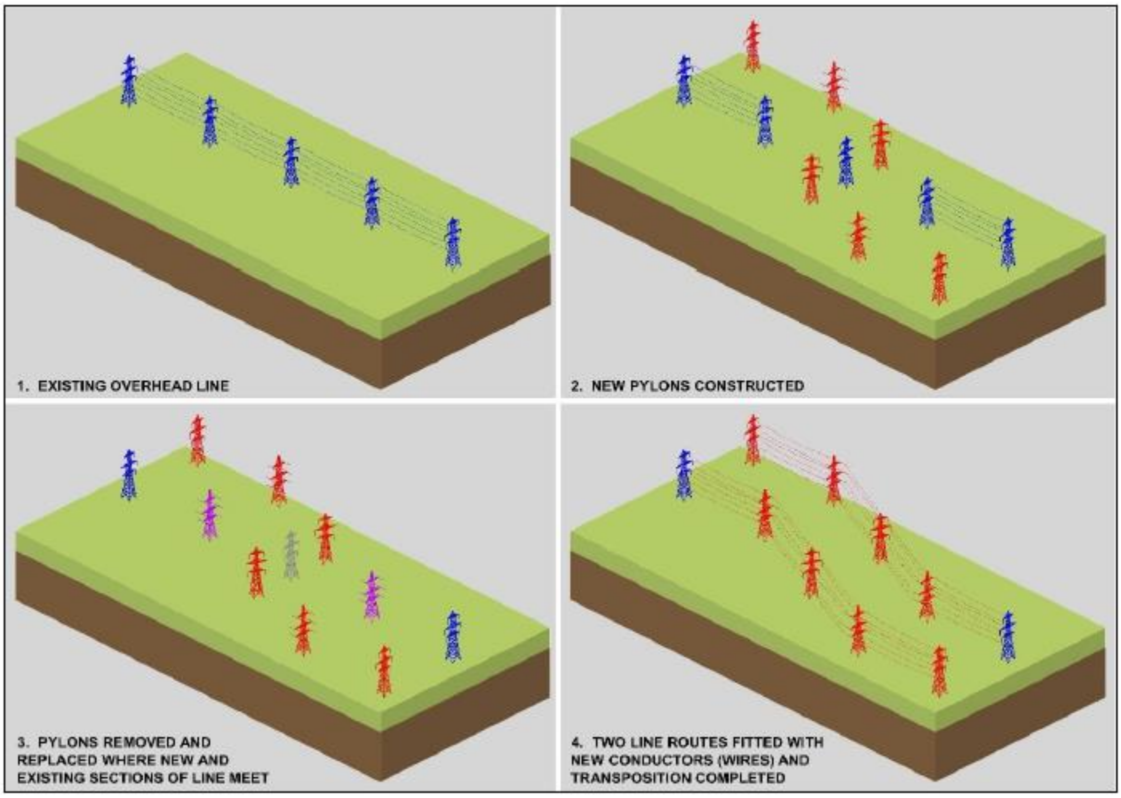
2.3.53 Plate 4.3 below illustrates a conductor pulling position and drums.

Plate 4.3 conductor pulling position and drums

Works to the Existing Line

2.3.54 The construction sequence is dictated to some extent by the need for ‘transposition’ points as described in section 3 of Chapter 3, Description of the Proposed Development (**Document 5.3**). A transposition point is, in effect, a 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 may also require the use of temporary pylons; a temporary pylon would require the same construction and operational land take as a permanent pylon. In order to ensure there is always a connection in operation it is necessary to work to a programme of planned outages[2]. A schematic of a transposition is provided in **Image 4.1** below.

Image 4.1 Transposition Process



2.3.55 Where transpositions occur it is likely that modifications to the existing 4ZA route infrastructure would be required such as pylon modifications / strengthening, foundation modifications / strengthening or new pylons and conductor bundles. This in turn develops a construction scenario whereby there would be: dismantling works; temporary diversion works; works to the existing 4ZA route; as well as the proposed new build works, all occurring in the same location.

2.3.56 As part of the Proposed Development, ten existing 4ZA pylons would be removed. It is most likely that pylon foundations would be cut off typically 1.5 m below ground level and subsoil and topsoil reinstated; however in exceptional circumstances the entire foundation may have to be removed.

[2] A temporary suspension in the transmission of electricity

Removal of Construction Equipment and Reinstatement of Ground and Restoration of Soils

2.3.57 Once the 400 kV OHL is constructed, the access tracks and working areas at the pylon site would be removed and the ground reinstated by removing stone and trackways. Soils would be restored to their previous condition. Other surfaces would be reinstated and widened accesses would be restored to the condition they were in at the commencement of the works.

2.4 TUNNEL

2.4.1 The construction of the tunnel would generally follow the following sequence of events:

- Installation of bellmouths and creation of visibility splays;
- Installation of stock proof fencing and gates or equivalent;
- Topsoil stripping, temporary drainage would be installed where required;
- Installation of access tracks (including culverts and bridges);
- Installation of the construction compounds at the drive and reception shafts;
- Shaft construction;
- Tunnel construction;
- Installation of cables; and
- Removal of construction equipment and reinstatement of ground and restoration of soils.

2.4.2 The following sections summarise the activities listed above.

Installation of Bellmouths and Creation Visibility Splays

2.4.3 Where new accesses or widening of existing accesses from the public highway are required bellmouths would be installed, in the same way as described above for the 400 kV OHL (see section 2.3.12).

2.4.4 The locations of the proposed bellmouths are shown on the Access and Rights of Way Plans (**Document 4.5**) and the Figure 4.1

Construction Plans (**Document 5.4.1.1**). Appendix 4.1, the Temporary Access Principle Note (**Document 5.4.2.1**) also provides a bellmouth schedule. Temporary bellmouths would be reinstated to the previous land use following completion of construction.

2.4.5 Each bellmouth and visibility splay would take up to four weeks to install.

2.4.6 The following bellmouths are required for the construction of the tunnel.

Braint:

- E7, F1, F1C and F2.

Tŷ Fodol:

- F3, F4, F5, F6, F7, F8, F9 and F14.

Installation of Fencing and Gates

2.4.7 Once a new or widened access point has been created the access track can be fenced off using approximately 1.2 m high stock proof fencing or equivalent. Gates or equivalent would be incorporated into the fencing to maintain access to farm tracks where required and maintain access to PROWs where agreed. The Access and Rights of Way Plans (**Document 4.5**) shows the PROW that would be affected and which ones would be temporarily stopped up or diverted. The PROW Management Plan (**Document 7.6**) provides details of how these would be managed during construction.

2.4.8 Approximately 100 m of fencing would be erected per day per construction gang. For example 300 m of access track with fencing either side would take one gang six days or three days with two gangs working.

Topsoil Stripping

2.4.9 The topsoil would be stripped from the access tracks. The topsoil would be stored carefully to one side; typically topsoil would be stored in bunds 4 m wide by 1.2 m high. Temporary drainage would be installed as required.

2.4.10 Topsoil stripping would typically be undertaken at a rate of approximately 10 m per day per construction gang.

Installation of Temporary Access Tracks (including Culverts and Bridges)

2.4.11 The access tracks would be up to 7 m wide, within a swath of land up to 25 m wide to allow for drainage, fencing and topsoil bund. The stone would be laid on a geotextile membrane (note that where tracks have to be built across ground which is wet or weak then the foundation subgrade may have to be installed using coarser sized rock and stone). Typical stone access tracks are shown on Design Plan DCO_DE/PS/11_02 Sheet 2 of 6 (**Document 4.13**). The proposed location of the temporary stone access tracks are shown on Figure 4.1 (**Document 5.4.1.1**).

2.4.12 The installation of the access tracks would typically take approximately 40 m per day per construction gang.

2.4.13 Culvert installation would be the same as for the 400 kV OHL (see sections 2.3.23 to 2.3.28).

2.4.14 Where culverts are not suitable for a particular crossing due to either the sensitivity of the watercourse or engineering requirements a temporary bridge would be installed. Illustrative bridge details for tunnel construction are shown on Design Plan DCO_DE/PS/11_06 Sheet 6 of 6 (**Document 4.13**) and the locations of the bridge crossings are shown on Figure 4.1 Construction Plans (**Document 5.4.1.1**).

2.4.15 The bridge abutments would first be marked out and the ground excavated to the desired level. Where practicable, excavated material would be laid and compacted to form the approach ramps to the bridge.

2.4.16 A layer of stone would be laid and compacted on top of a geotextile membrane to provide a solid base for the concrete abutments. Shuttering would be delivered and installed inside the excavation, providing the formwork for the concrete abutments.

2.4.17 A steel reinforcing cage would then be positioned after which the concrete would be poured. The final foundation design would be dependent on the ground conditions.

2.4.18 Once the abutments are cured the temporary bridge can be fitted. Although the installation method is dependent on the type of bridge being installed, a typical bridge would be delivered in sections. Each bridge component would be assembled on site and lifted into position by crane. For the heavy loads involved, additional measures may be required to provide a suitable foundation for the crane and crane outriggers.

2.4.19 Once the bridge is in position, decking panels would be lifted and fixed into position.

2.4.20 The installation of each bridge would take approximately up to 15 days. A list of the bridge crossings for the tunnel construction access tracks is set out in Table 4.2 below.

Table 4.2: Bridge Crossing Locations

Crossing ID	Watercourse Name
NG-RVX E/241	Braint
NG-RVX F/243	Braint Bifurcation
NG-RVX F/256	Unnamed

Proposed Use of Access Tracks

2.4.21 Table 4.3 sets out the proposed use of the access tracks for the tunnel, and Tunnel Head House (THH)/Cable Sealing End Compound (CSEC) construction.

Table 4.3: Proposed Use of Temporary Access Tracks

	Access Track from Bellmouth	Proposed Use
Braint Construction Compound	F1C	Main construction access
	F1	Enabling / emergency use only and would become the permanent access
	F2	Enabling / Contingency use only and likely access for abnormal indivisible loads
	E7	Contingency use only and would be used for the construction of the 400 kV

Table 4.3: Proposed Use of Temporary Access Tracks		
	Access Track from Bellmouth	Proposed Use
		OHL
Tŷ Fodol Construction Compound	F14 (via F9, F8, F7, F6, F5, F4)	Main construction access
	F3	Enabling / emergency use only and would become the permanent access

Installation of the Construction Compounds

2.4.22 Construction compounds would be established at the drive and reception shafts for the tunnel and are referred to as the Braint Construction Compound and the Tŷ Fodol Construction Compound.

2.4.23 The topsoil would be stripped from the compound sites. The topsoil would be stored carefully; typically topsoil would be stored in bunds 2 m in height. Temporary drainage would be installed as required.

2.4.24 Temporary drainage proposals would be developed in line with an agreed Drainage Management Plan (DMP) and would achieve green field run off rates in line with SuDS principles. Any seepage into the tunnel during construction would be pumped out through the shafts, and could include saline water. The construction compounds would both include a separate area for saline water treatment if required.

2.4.25 The construction compounds would typically include:

- Site offices and welfare facilities;
- Power supply
- Car parking;
- Wheel wash;
- Holding areas for Heavy Goods Vehicles (HGVs) and other vehicles;

- Storage containers;
- Site vehicles;
- Welfare facilities;
- Crawler crane;
- Construction machinery;
- Segment storage/aggregate bins;
- Gantry crane;
- Temporary spoil storage;
- Material storage;
- Slurry screening plant/concrete batching plant;
- Generators (for backup use);
- Water tank;
- Tunnel boring machine (TBM) cooling plant;
- Grouting plant;
- Fire hydrant and firefighting equipment;
- Acoustic enclosures as required;
- Waste water treatment plant;
- Oil separator; and
- Surface water treatment/settlement.

Braint Construction Compound

2.4.26 This site is centred on Grid Reference SH 517 710, is approximately 5.64 hectares (ha) and is shown on Works Plan DCO_F/WO/PS/01 Sheet 1 of 5 (**Document 4.13**) and Figure 4.1 National Grid Construction Plan (**Document 5.4.1.1**). DCO Design Plan DCO_DE/PS/12_02 sheet 2 of 5 provides an illustrative layout for the Braint Construction Compound.

2.4.27 The establishment of Braint Construction Compound would take approximately four months.

Tŷ Fodol Construction Compound

2.4.28 This site centred on Grid Reference SH 546 683, is approximately 5. ha and shown on Works Plan DCO_F/WO/PS/01 Sheet 4 of 5 (**Document 4.13**) and Figure 4.1 National Grid Construction Plan (**Document 5.4.1.1**). DCO Design Plan DCO_DE/PS/12_03 sheet 3 of 5 provides an illustrative layout for the Tŷ Fodol Construction Compound.

2.4.29 The establishment of Tŷ Fodol Construction Compound would take approximately four months.

Tunnelling Scenarios

2.4.30 There are three scenarios for tunnel construction, these are:

- Scenario 1 –TBM from Braint to Tŷ Fodol;
- Scenario 2 – TBM from Tŷ Fodol to Braint; and
- Scenario 3 – Drill and Blast from both shafts.

2.4.31 The scenarios are referred to as appropriate in the following sections.

2.4.32 All three scenarios have been considered within this Environmental Impact Assessment (EIA). Whilst all three scenarios have been considered there is a preference the TBM scenarios and for scenario 1.

Shaft Construction

2.4.33 Construction of the tunnel would require the sinking of vertical shafts at each end of the tunnel, to enable access for tunnelling.

2.4.34 Shaft construction would be split into two phases; phase 1 would be the sinking of shafts to enable the tunnelling works to commence and phase 2 would be works to the shafts themselves.

Phase 1

2.4.35 The tunnel shaft at Braint would be approximately 75 m deep and Tŷ Fodol approximately 95 m deep. Both shafts would have an internal diameter of 15 m. An illustrative shaft cross section is shown on Design Plan DCO_DE/PS/07_02 Sheet 2 of 2 (**Document 4.13**).

2.4.36 Due to the softer material overlying bedrock in both of the proposed shaft locations, the shafts would be excavated in two stages. Construction methods for each stage are outlined below.

2.4.37 Stage 1 through soft ground (likely to be segmental caisson construction): In the caisson method, the precast concrete rings are erected at the surface and are then lowered into the ground whilst excavation progresses. It is assumed that this technique would be suitable for the top c.15 m at Braint and top c.20 m at Tŷ Fodol based on the known geology. Other options that could be considered include secant piling or diaphragm walling, but these are considered unlikely.

2.4.38 Stage 2 through rock: Drill and blast of the shaft would be the likely approach and work would progress over a 24 hour working day. Drilling preparation would be expected every other day (drilling and placing charges) followed by the 'blast'. A specially designed blast mat would be used to confine the blast fumes and rock fragments. It is also used to reduce the noise generated. A blast mat is generally placed at the top of the shaft.

2.4.39 Post blast, time is given to allow the area to become safe to re-enter. The face of the shaft would then be examined in each sequence of rock excavation; the lithology of the exposed rock face (shaft wall) would then be mapped by the site geologist to enable the necessary support requirements to be determined. Highly strong and competent rock may only require spot bolting, where necessary, without the need to apply any sprayed concrete. However, weaker rocks may require the use of a combination of rock bolts and sprayed concrete lining (the sprayed concrete would be reinforced with either steel fibre or steel bar to provide the sufficient tensile strength and crack resistance).

2.4.40 The rock material would be removed using cranes/hoists/buckets and stored within the construction compound prior to being loaded onto HGVs for transport off site.

2.4.41 If a Tunnel Boring Machine (TBM) were used to construct the tunnel, a TBM launch chamber would also need to be excavated at the base of the launch shaft; the launch chamber would be approximately 120 m in length with an excavation area of approximately 35 m^2. Single or twin service tunnels would be excavated in both shafts regardless of tunnelling method 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 slab would be installed.

2.4.42 Table 4.4 provides the approximate durations of the phase 1 shaft sinking for the three tunnelling scenarios.

Table 4.4: Approximate durations of the phase 1 shaft sinking			
Shaft	Scenario 1	Scenario 2	Scenario 3
Braint	240 days	225 days	205 days
Tŷ Fodol	225 days	245 days	210 days

Shaft Arisings

2.4.43 The shaft arisings from Braint would be approximately 15,400 cubic metres and from Tŷ Fodol 19,224 cubic metres.

Phase 2

2.4.44 On completion of the tunnelling work a secondary lining would be applied to the completed shaft. Geotextile membranes may be used between the rock and the concrete lining. The shaft lining would be installed by casting the concrete in situ working from the base of the shaft upwards. Once any required lining had been completed the internal works would be carried out to line the shafts, install internal walls, install cable support structures, stairs and lift enclosures.

2.4.45 Table 4.5 provides the approximate durations of the phase 2 shaft construction for the three tunnelling scenarios.

Table 4.5: Approximate durations of the phase 2 shaft construction			
Shaft	Scenario 1	Scenario 2	Scenario 3
Braint	245 days	373 days	220 days
Tŷ Fodol	388 days	295 days	255 days

Tunnel Construction

2.4.46 The tunnel would be constructed using either a TBM or the Drill and Blast method. Both these methods are described below.

TBM Construction Method

2.4.47 The TBM would be delivered in large sections and lowered into the shafts using a mobile crane of up to 500 t capacity. The TBM would then be assembled at the base of the drive shaft. The TBM would be launched from one shaft (the drive shaft) and exit by the other (the reception shaft). The excavated material would consist of a mixture of the natural rock or substrate, bentonite or clay, and water (slurry) which provides the face support inside the cutting head chamber. It is considered likely that the TBM used would either be a slurry TBM or an Earth Pressure Balance (EPB) TBM.

2.4.48 Using a slurry TBM the pressurised slurry is used in the face of the TBM to balance the ground and ground water pressures. Minimum and maximum pressures would be developed prior to the commencement of tunnelling. The pressures would be monitored continuously so that flows into or away from the face do not occur. Using a slurry TBM the excavated material would be pumped to a separation plant (also referred to as slurry screening plant) located on the surface within the construction compound. The separation plant enables the slurry to be recycled and the excavated natural rock or substrate to be reused.

2.4.49 Using the EPB method the TBM would use excavated material, modified using drilling fluids to balance the ground and water pressures. The drilling fluids used would be dependent on the ground conditions present and pressures would be continually monitored and adjusted for the conditions. Using an EPB TBM the excavated material would be taken to the surface using a conveyor system or in muck cars/skips where the excavated natural rock or substrate would be separated.

2.4.50 For either type of TBM grouting ahead may be carried out and precast concrete segments would be used to line the tunnel and these would be installed behind the cutting head.

Drill and Blast Construction Method

2.4.51 The drill and blast tunnelling method would be the same as used for the stage 2 shaft construction. It would involve drilling multiple holes in the rock of the progressive tunnel face, setting of the explosives, and finally the blasting itself. 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. It is anticipated that three blasts per day would be carried out at each end (six blasts per day in total).

2.4.52 Advanced probing would be used to provide information on the ground conditions ahead of the face to allow working methods to be varied as appropriate which could include charge weights and blast patterns. Grouting ahead may also be carried out if required dependent on the ground conditions.

2.4.53 Methods of supporting the rock after excavation vary widely. Typically the rock face and tunnel wall would be supported by installing primary support/lining which would support the temporary rock loads. This would be followed by installation of secondary lining which would form the permanent tunnel wall. The typical rock primary support/lining system can include installation of rock bolts or rock dowels with sprayed concrete, or lattice girder arch ribs in conjunction with steel mesh reinforcement. The secondary support/lining system can include casting of reinforced or un-reinforced insitu concrete or steel fibre reinforced sprayed concrete lining. In some instances, the primary and secondary lining are combined into ‘one pass lining’. The sprayed concrete lining may require a concrete batching plant on site comprising storage silos, conveyors and mixing equipment.

2.4.54 Table 4.6 provides the approximate durations of the three tunnelling scenarios, which include tunnel cleanout.

Table 4.6: Approximate durations of tunnelling

Scenario 1	Scenario 2	Scenario 3
478 days	478 days	455 days

Tunnel Arisings

2.4.55 The tunnel arisings resulting from the TBM scenarios would be approximately 80,553 cubic metres inclusive of the TBM launch and reception chambers. The excavated material would arise at the drive shaft. For Scenario 1 this would be Braint and for Scenario 2 this would be Tŷ Fodol.

2.4.56 The tunnel arisings resulting from the Drill and Blast scenario would be approximately 112,500 cubic metres. Excavated material would be removed through both of the shafts.

2.4.57 The arising from the service tunnels would be approximately 7,000 cubic metres per tunnel and would arise at the associated shaft.

2.4.58 Overall depending on the method of tunnelling and including the shafts between 350,000 and 440,000 tonnes of material would be produced.

Dewatering

2.4.59 During construction both the shafts and tunnel would be subject to water ingress and would therefore need to be dewatered. This water would be pumped out of the tunnel and shafts to the attenuation ponds within the construction compounds. There is the potential that water from sections of the tunnel close to the Menai Strait could be saline and, if so, temporary sumps would be used within the tunnel to prevent saline and fresh water mixing. Once the full depths of the shafts had been excavated the anticipated dewatering rates would be 30 m^3/day from each shaft. Should a TBM be used there could be a further 5 m^3 /day from the tunnel which would be pumped to the Braint Construction Compound under scenario 1 or Tŷ Fodol Construction Compound under scenario 2. Should drill and blast be used as the tunnelling method the peak anticipated rate of dewatering from the tunnel once, the full length is constructed, would be 900 m^3/day, which would be pumped to Braint Construction Compound. This rate would decrease as the secondary lining was installed. Once the secondary lining had been completed the dewatering requirement at Braint would be 35 m^3/day and 30 m^3/ at Tŷ Fodol.

Installation of Cables

2.4.60 Once the tunnelling work had been completed, cables would be delivered to site on cable drums and specialist cable pulling machines would be used to tow the cables into position.

2.4.61 The installation of the cables would take approximately 300 days

Reinstatement

2.4.62 Following completion of the tunnel and installation of the cables, the construction compounds and the temporary access tracks would be reinstated subject to the proposed THH and CSECs, including the permanent accesses discussed in section 4 of Chapter 3 (**Document 5.3**).

2.5 TUNNEL HEAD HOUSES AND CABLE SEALING END COMPOUNDS

2.5.1 The construction of both Braint and Tŷ Fodol THHs and CSECs would be undertaken after completion of the tunnel and would utilise the same construction compound and temporary access tracks as the tunnel; these are described above. The layout of the two construction compounds may require alteration to accommodate the construction of the proposed permanent above ground infrastructure. This would remain within the boundaries of the construction compounds shown on Works Plan DCO_F/WO/PS/01 Sheet 1 of 5 (**Document 4.13**) and Figure 4.1 National Grid Construction Plan (**Document 5.4.1.1**).

2.5.2 Drainage proposals would be developed for both of the THH/CSECs in line with an agreed DMP and would achieve green field run off rates in line with SuDS principles.

Tunnel Head Houses

2.5.3 Tunnel Head Houses would be constructed over both shafts. These would contain the typical equipment listed in Table 3.8 in Chapter 3 (**Document 5.3**). These would be installed over the shafts within the parameters shown on Design Plan DCO_DE/PS/09_01 Sheet 1 of 8 (**Document 4.13**) for Braint THH and Design Plan DCO_DE/PS/09_05 Sheet 5 of 8 (**Document 4.13**) for Tŷ Fodol THH. The sequence of events to construct the THHs would be construction of the building envelope, fit out and finish, installation of services and creation of hard and soft landscaping.

2.5.4 Each THH would take approximately 145 days to construct.

Cable Sealing End Compounds

2.5.5 Both CSECs would be installed within the parameters shown on Design Plan DCO_DE/PS/09_01 Sheet 1 of 8 (**Document 4.13**) for Braint CSEC and Design Plan DCO_DE/PS/09_05 Sheet 5 of 8

(**Document 4.13**) for Tŷ Fodol CSEC. The piled foundations for the gantry would be installed, as would some of the electrical equipment, including troughs for the underground cables. A series of copper earth tapes would be installed below the ground to create an “earth mat” to make the CSE electrically safe.

2.5.6 Once the troughs had been completed the underground cables would be channelled, via the troughs, from the tunnel into the CSE structures. The CSE terminations, line gantries and other electrical equipment that would protect and control the power connection, would be lowered onto their foundations and support structures by a mobile crane. The CSEs would require a clean and controlled environment whilst being installed. To create a clean environment, a scaffold structure would be erected over the installation area and covered with weather-proof material. The electrical installation would be completed with connections of the 400 kV OHL to the underground electrical cables via downleads. Downleads would bring the conductors down to join on to the ends of the underground cables at the top of the CSE structures.

2.5.7 Each of the CSECs would take approximately 125 days to construct.

Reinstatement

2.5.8 The temporary site installation facilities would be removed and temporary working area would be restored to their original condition. The area around the THH/CSEC would be landscaped including land re-profiling and planting. The indicative landscaping proposals for this area are shown on Figures 7.14 and 7.15 (**Documents 5.7.1.14 and 5.7.1.15**).

2.6 SUBSTATIONS

Wylfa Substation

2.6.1 Wylfa Substation is located adjacent to the existing Wylfa Nuclear Power Station and is centred on Grid Reference SH 352 938. A small extension would be required to the site boundary and items of existing equipment would need to be removed and new equipment installed. Works would include:

- dismantling and removal of redundant substation structures, equipment and plant, including cables, steelwork, foundations, firewall, support structures, cable ducts and troughs;

- earthworks including to provide a suitable base for structures, roads and compounds;
- construction of foundations to support all new structures and equipment;
- installation of four gantries for the termination of overhead electric line connections into the substation (4AP and 4ZA);
- installation of equipment between the new gantries and switchgear;
- installation of support structures;
- installation of switchgear and equipment;
- installation of electrical control panels;
- installation of troughs and below ground services; and
- installation of a section of new fence line

2.6.2 A small construction compound would be established within the existing site boundary to the north-east of the existing substation. This is shown on Design Plan DCO_DE/PS/01_02 Sheet 2 of 10 (**Document 4.13**) and on the Construction Plans included as Figure 4.1 (**Document 5.4.1.1**). The construction compound would include temporary offices, welfare facilities, security cabin and fencing and gates, emergency electrical generator, construction and security lighting, material laydown and storage (including storage for tools, fuel, plant and equipment), construction waste management facilities, drainage works, parking areas and hard standing.

2.6.3 Drainage proposals would be developed in line with the DMP.

2.6.4 The construction works at Wylfa Substation would be undertaken over approximately 16 months, undertaken in stages to suit outages and circuit commissioning and re-energisation.

Pentir Substation

2.6.5 Pentir Substation is located in north-west Gwynedd and is centred on Grid Reference to SH 559 677. The proposed layout is shown on Design Plan DCO_DE/PS/01_05 Sheet 5 of 10 (**Document 4.13**).

2.6.6 The main construction compound would be located within the Pentir Construction Compound described in section 2.3.4 and a small satellite construction compound would be established at the north-western extent of the proposed extension this are shown on Design Plan DCO_DE/PS/01_05 Sheet 5 of 10 (**Document 4.13**) and on the Construction Plans included as Figure 4.1 (**Document 5.4.1.1**).

2.6.7 The Pentir Construction Compound would include temporary project offices, welfare facilities, security cabin and fencing and gates, utility service connections for electricity and potable water and/or connection of power supply to temporary generators, utility service connections or on site storage for later disposal of grey water and sanitation, emergency electrical generator, construction and security lighting, material laydown and storage (including storage for tools, fuel, plant and equipment), construction waste management facilities, assembly areas, earthworks, drainage works and discharge to watercourses, ground improvement, wheel cleaning facilities, parking areas and hard standing.

2.6.8 The primary construction access on to construction traffic routes would be via bellmouth F14 shown on Figure 4.1 National Grid Construction Plan (**Document 5.4.1.1**). However Light Goods Vehicles (LGV) site traffic may also use bellmouths F11 shown on Figure 4.1 National Grid Construction Plan (**Document 5.4.1.1**).

2.6.9 The initial preparatory works would comprise the temporary removal and storage of topsoil and the installation of a temporary stone capping in the substation construction area to provide a clean and stable working platform. An earth grid would be installed below the ground to create an 'earth mat' to make the compound electrically safe. The substation support structures and electrical equipment would then be installed within the parameters shown on Design Plan DCO_DE/PS/01_04 Sheet 4 of 10 (**Document 4.13**).

2.6.10 Works undertaken would include:

- dismantling and removal of redundant substation structures, equipment and plant, including cables, steelwork, foundations, firewall, support structures, cable ducts, troughing and vegetation;
- earthworks, including to create platforms for the new substation equipment, structures, landscaping, roads and compounds;

- construction of foundations to support all new structures and equipment;
- construction of gantries for the termination of overhead electric line connections into the substation;
- installation of equipment between gantries and switchgear;
- installation and replacement of underground 400 kV cables, including to facilitate the connection of new overhead line electric connections into the substation;
- installation of a 400 kV shunt reactor including means of enclosure;
- the reconfiguration of existing substation equipment;
- the installation of new ST pylon (4ZB001A) including foundations, steelwork and associated conductors, insulators and fittings and the modification of existing pylon 4ZB001;
- installation of new portable relay rooms;
- installation of support structures;
- installation of switchgear and equipment;
- installation of electrical control panels;
- installation of troughs and below ground services;
- extension of the substation perimeter fence;
- modifications to existing site access roads, hardstanding, and drainage;
- landscaping at either end of the existing substation; and
- installation of other site furniture;

2.6.11 The construction works at Pentir Substation would be undertaken over approximately 33 months although work would not be continuous and may need to be undertaken in stages to suit outages and circuit commissioning and re-energisation.

Reinstatement

2.6.12 The temporary site installation facilities would be removed and temporary working areas would be restored to their original condition where landscape planting is not proposed. The indicative landscaping proposals for this area are shown on Figure 7.16 (**Document 5.7.1.16**).

2.7 CONSTRUCTION TRAFFIC ROUTES

2.7.1 Construction traffic routes are the public roads upon which construction vehicles would travel to site having left the Strategic Road Network, in this case the A55. The proposed construction traffic routes for the construction of the Proposed Development are shown on Figure 13.2 (**Document 5.13.1.2**).

2.7.2 These are categorised in to eight types:

- Primary HGV and LGV Construction Traffic Route (LGV = vehicles 3.5 t or below in gross weight; and HGV = vehicles above 3.5 t in gross weight);
- LGV/Tractor Trailer Only Construction Traffic Route;
- Primary LGV Construction Traffic Route;
- HGV and LGV Enabling Works Construction Traffic Route;
- HGV/LGV Contingency Construction Traffic Route;
- Emergency Access Route;
- THH/CSEC Operation and Maintenance Route; and
- Abnormal Indivisible Load Construction Traffic Route.

2.7.3 The construction traffic routes have been split down into links; Table 4.4 below describes the links and how they would be used. The links are illustrated on Figures 13.2 and 13.8 (**Documents 5.13.1.2 and 5.13.1.8**). Chapter 13 (**Document 5.13**) provides predicted volumes of traffic on each link during the construction of the Proposed Development. The Outline Construction Traffic Management Plan (OCTMP) (**Document 7.5**) details the mitigation measures which have been included within the Proposed Development and would be implemented to mitigate, so far as reasonably practicable, the impact of traffic generated during the construction phase of the Proposed Development.

2.7.4 As part of the Wylfa Newydd Power Station development proposals they are proposing a number of offline works to the A5025 (Link 1), these are shown on Chapter 20, Figure 1 (**Document 5.20.1.1**). Where appropriate the technical Chapters 7-18 (**Documents 5.7 to 5.18**) have taken both existing and proposed realigned alignments into account.

Table 4.4: Highway Link Description for LGV / HGV / AIL Construction Traffic Routes

Link Reference	Highway Link	Description	HGV / LGV / AIL	Proposed Development Element	Category
1	A5025	A5025 between A5 at Valley Crossroads and Wylfa.	HGV	23 New Pylons and Wylfa Substation.	Primary HGV / LGV
2	A5	A5 between A55 J3 and Valley Crossroads.	HGV	Access to the A5025.	Primary HGV / LGV
3	Unnamed Road (UR) 4	UR 4 between B5111 and B2	HGV	13 New Pylons.	Primary HGV / LGV
4	B5111	B5111 between B5110 and B5112	HGV	33 New Pylons.	Primary HGV / LGV
4.1	B5111	B5111 between the B5110 and access B8.	HGV	33 New Pylons.	Primary HGV / LGV
5	B5110	B5110 between Llangefni and	HGV	20 New Pylons.	Primary HGV/LGV

Table 4.4: Highway Link Description for LGV / HGV / AIL Construction Traffic Routes					
Link Reference	Highway Link	Description	HGV / LGV / AIL	Proposed Development Element	Category
		access C8.			
6	B5420	B5420 between LLR and B5110	HGV	Access to B5110 and B5111.	Primary HGV/LGV
7	B5420	Between Llangefni Link Road and Access D4	HGV	9 New Pylons and OHL Penmynydd Road Construction Compound.	Primary HGV/LGV
7.1	B5420	Between Access D4 and Four Crosses Roundabout.	HGV	9 New Pylons and Penmynydd Road Construction Compound.	HGV/LGV Contingency Route
8	A5114	Between A55 J6 Llangefni Link Road.	HGV	Access to Llangefni Link Road.	Primary HGV/LGV
8.1	Industrial Estate Road	Between A5114 via existing carriageway to Llangefni Link Road	HGV	Access to Llangefni Link Road, B5420, B5110 and B5111.	Primary HGV/LGV
8.2	Llangefni Link Road (LLR)	LLR between Llangefni Industrial Estate and the B5420.	HGV	Access to B5420, B5110 and B5111.	Primary HGV/LGV
9	A5025	A5025 between A55	HGV	9 New Pylons and OHL	HGV/LGV Contingency

Table 4.4: Highway Link Description for LGV / HGV / AIL Construction Traffic Routes					
Link Reference	Highway Link	Description	HGV / LGV / AIL	Proposed Development Element	Category
		J8 to B5420.		Penmynydd Road Construction Compound.	Route
11	Unnamed Road 21	Unnamed Road between Star and access E5.	HGV	8 New Pylons.	Primary HGV/LGV
11.1	Unnamed Road 21	UR between Star Crossroads and Unnamed Road Star	HGV	8 New Pylons.	Primary HGV/LGV
12	A5152	Between A55 J7 and A5.	HGV	Access to A5 and access E5A.	Primary HGV/LGV
13	A5	A5 between A5152 and A55 J7a.	HGV	Access to Pont Ronwy Link, NCR 8 and Unnamed Road 21.	Primary HGV/LGV
14	NCR8	Between A5 and access E7	HGV	5 New Pylons, Braint THH/CSEC.	Primary HGV/LGV Route for OHL construction HGV/LGV Contingency Route for tunnel construction

Table 4.4: Highway Link Description for LGV / HGV / AIL Construction Traffic Routes

Link Reference	Highway Link	Description	HGV / LGV / AIL	Proposed Development Element	Category
					Primary LGV Route LGV/Tractor Trailer Route
15	Pont Ronwy Link (PRL)	PRL between A5 and access F1	HGV	5 New Pylons, Braint THH/CSEC .	Primary HGV/LGV Route for tunnel construction HGV/LGV Enabling Works Emergency Access Route THH/CSEC Operation and Maintenance Route
15.1	Pont Ronwy Link (PRL)	Pont Ronwy Link (PRL) / Unnamed Road 22 Between Access F1 and A4080	HGV	Enabling works to facilitate the construction of F1C	HGV/LGV Enabling Works Emergency Access Route THH/CSEC Operation and Maintenance

Table 4.4: Highway Link Description for LGV / HGV / AIL Construction Traffic Routes

Link Reference	Highway Link	Description	HGV / LGV / AIL	Proposed Development Element	Category
					Route
16	A4080	A4080 between A5 at tollgate and F2.	HGV / AIL	AIL route to Braint Tunnel Head House (THH).	Abnormal Indivisible Load HGV/LGV Enabling Works HGV/LGV Contingency Route
17	A5	A5 Between A55 J8a and A4080	HGV / AIL	Access to A4080.	Abnormal Indivisible Load HGV/LGV Enabling Works HGV/LGV Contingency Route
18	A487	A487 Between B4547 and A55 J9.	HGV	3 New Pylons, Tŷ Fodol THH/CSEC and Pentir Substation.	Primary HGV/LGV
18.1	A4087	A4087 Between A55 J10 and A487	HGV	3 New Pylons, Tŷ Fodol THH, SEC and Pentir	HGV/LGV Contingency Route

Table 4.4: Highway Link Description for LGV / HGV / AIL Construction Traffic Routes

Link Reference	Highway Link	Description	HGV / LGV / AIL	Proposed Development Element	Category
				Substation.	
19	B4547	B4547 between A4244 and A487.	HGV / AIL	3 New Pylons, Tŷ Fodol THH/ CSEC and Pentir Substation and Pentir Construction Compound.	Primary HGV/LGV
20	A4244	A4244 between A5 and B4547	HGV / AIL	Primary HGV and AIL route between the A55 and B4547.	Primary HGV/LGV Abnormal Indivisible Load
21	A55	Britannia Bridge between A55 J9 and A55 J8a	HGV / AIL	Link of strategic importance and access to Proposed Development elements on Anglesey and Gwynedd.	Primary HGV/LGV Abnormal Indivisible Load
22	B5109	B5109 between LLR and access D2	LGV	Alternative LGV access route to OHL.	LGV/Tractor Trailer Route
23	Ffordd y Felin	Ffordd y Felin between A5025 and	LGV	Alternative LGV access route to OHL.	Primary LGV Route

Table 4.4: Highway Link Description for LGV / HGV / AIL Construction Traffic Routes					
Link Reference	Highway Link	Description	HGV / LGV / AIL	Proposed Development Element	Category
		Brynddu Road			
24	B5110	B5110 between access C8 and UR 19	LGV	Alternative LGV access route to OHL.	LGV/Tractor Trailer Route
25	Brynddu Road	Brynddu Road Between Ffordd y Felin and access B2	LGV	Alternative LGV access route to OHL.	LGV/Tractor Trailer Route
26	B5112	B5112 between A55 J5 and B5111	LGV	Alternative LGV route access to B5111.	Primary LGV Route
27	UR 1	UR 1 between Brynddu Road and UR 4	LGV	Alternative LGV access route to OHL.	LGV/Tractor Trailer Route
28	UR 8	UR8 between B5111 and access B11	LGV	Alternative LGV access route to OHL.	LGV/Tractor Trailer Route
29	UR 9	UR9 between B5111 and access C2	LGV	Alternative LGV access route to OHL.	Primary LGV Route
30	Fodolydd Lane	Fodolydd Lane between B4547 and access F3	LGV	Alternative LGV access route to Tŷ Fodol THH, SEC and 400 kV OHL.	HGV/LGV Enabling Works Primary LGV Route Emergency Access Route

Table 4.4: Highway Link Description for LGV / HGV / AIL Construction Traffic Routes

Link Reference	Highway Link	Description	HGV / LGV / AIL	Proposed Development Element	Category
					THH/CSEC Operation and Maintenance Route
31	UR 10	UR10 between B5111 and access C4	LGV	Alternative LGV access route to OHL.	LGV/Tractor Trailer Route
32	UR 16	UR 16 between B5420 and access E1	LGV	Alternative LGV access route to OHL.	LGV/Tractor Trailer Route
33	UR 19	UR 19 between B5110 and access C6	LGV	Alternative LGV access route to OHL.	LGV/Tractor Trailer Route
34	Fodolydd Lane	Fodolydd Lane between B4547 and access F7 (enabling works only)	HGV	Access for bridge construction during enabling works.	HGV/LGV Enabling Works Primary LGV Route Emergency Access Route THH/CSEC Operation and Maintenance Route

Table 4.4: Highway Link Description for LGV / HGV / AIL Construction Traffic Routes					
Link Reference	Highway Link	Description	HGV / LGV / AIL	Proposed Development Element	Category
35	UR 3	UR 3 between Brynddu Road and access A9	`	Alternative LGV access route to OHL.	LGV/Tractor Trailer Route
36	North of J7	North of J7 between A55 and access E5A	HGV	8 New Pylons.	LGV/Tractor Trailer Route

2.8 THIRD PARTY ASSETS

2.8.1 In order to construct the Proposed Development it is proposed to modify a number of existing third party services, (for example low voltage power lines operated by the Distribution Network Operator (DNO) or telephone lines). This would be done by either placing an existing above ground third party service underground or re routeing an existing underground third party service. The location of the assets to be modified and the proposed area within which the third party asset would be modified are shown on Figure 4.2 Third Party Construction Plans (**Document 5.4.1.2**).

2.8.2 The works would most likely be undertaken by the asset owners prior to construction of the relevant section of the Proposed Development, however the Draft DCO (**Document 2.1**) would grant National Grid the power to undertake this work. The following sections set out the principles which would be applied to the works and which have been assessed by the technical Chapters (**Documents 5.7 to 5.18**).

Distribution Network Operator (DNO) Overhead Lines of Voltages up to and Including 33 kV and Open Reach Overhead Lines

Temporary Access

- likely to take access using existing farm access gates.

- most of the work would be done in advance of the National Grid access tracks being in place and the third party access tracks on Figure 4.2 Third Party Construction Plans (**Document 5.4.1.2**) would therefore be utilised. Where a National Grid access track was already in place, and if it were appropriate to do so, these would be used.

- the works would not require stone access track construction and would use all-terrain or low pressure bearing vehicles to drive over existing field surfaces. However, in wet ground an interlocking track mat may be used to protect the ground, this would only be in place for the duration of the works.

- any damage would be repaired on leaving site by agreement with the land owner.

<u>Placing the Overhead Line Underground</u>

- electricity supply would be switched off remotely, the circuit isolated and permit to work issued

- access would be taken in line with the principles set out above.

- the existing overhead line system would be physically disconnected from the wood pole structures to be removed.

- a cable trench of approximately 300 millimetres (mm) wide and 600 mm deep would be excavated, by use of a mini digger within a working area of up to 1.5 m either side of the trench.

- the cable would be laid on a bed of sandy type material, covered with tile and tape and more sandy material and the trench backfilled.

- the works would be carried out in accordance with standard soil management and safety requirements.

- an all-terrain vehicle would be used to remove the existing overhead line cable.

- the circuit would then be tested, de-isolated and returned to service.

- the existing wood poles would be removed generally by excavating down one side of the structure, to allow room for movement, and then part pulling the structure over and then lifting it out. By excavating down the side of the pole, the type of foundation and soil condition would be exposed to ascertain the potential to fully remove the pole. In instances where the full removal of the pole would be problematic the usual solution would be to excavate around the base of the pole and then cut it off below ground level. In all cases the redundant poles, conductor, insulators and fittings would be removed from site and the disturbed foundation area reinstated.

- each existing OHL asset that requires modification would be likely to take five days to complete however this may not be continuous.

Connections onto the Existing Circuits

- where the asset is placed underground and requires transition from buried cable back onto the existing overhead line this would take place via an existing wood pole but additional equipment, including some back stay support, would be likely to be required. The back stay support would be provided to transfer any out of balance load on the pole down and into the ground.
- where the connection was to an existing cable this would be via a cable joint. A joint bay of approximately 600 mm deep and 2 m wide would be installed, and there would be a 1.5 m working areas around the bay.

Distribution Network Operator (DNO) Removal of a Section of Existing 132 kV Overhead Line

2.8.3 This applies to one crossing on Anglesey near to Rhosgoch, crossing IDs AP-OHLX A/65, NG-OHLX A/77 & ZA-OHLX A/71 as illustrated on Figure 1 of Appendix 3.4 (**Document 5.3.2.4**). Works would involve removal of the conductors and existing wood poles. All-terrain vehicles would be used to remove the infrastructure.

- the existing wood poles would be removed generally by excavating down one side of the structure, to allow room for movement, and then part pulling the structure over and then lifting it out. By excavating down the side of the pole, the type of foundation and soil condition would be exposed to ascertain the potential to fully remove the pole. In instances where the full removal of the pole was considered to be problematic the usual solution would be to excavate around the base of the pole and then cut it off below ground level. In all cases the redundant poles, conductor, insulators and fitting would be removed from site and the disturbed foundation area reinstated.

- back stay of wood poles may be required at each side of the conductor removal. The back stay support would be provided to transfer any out of balance load on the pole down and into the ground.

- access would be taken as described for the 33 kV line above.

2.9 CONSTRUCTION PROGRAMME

2.9.1 The high level construction programme for the Proposed Development is shown in Table 4.5.

Tunnel scenario 1 (TBM Anglesey to Gwynedd)	
Tunnel scenario 2 (TBM Gwynedd to Anglesey)	
Tunnel scenario 3 (Drill and Blast)	
Overhead Line	
Wylfa Substation	
Pentir Substation	

Table 4.5 High Level Construction Programme																										
Year	2020			2021				2022				2023				2024				2025				2026		
Quarter	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
Tunnel																										
Temporary access tracks to Braint Construction Compound																										

Table 4.5 High Level Construction Programme

Year	2020			2021				2022				2023				2024				2025				2026		
Quarter	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
Establishment of Braint Construction Compound																										
Temporary access tracks to Tŷ Fodol Construction Compound																										
Establishment of Tŷ Fodol Construction Compound																										
Braint Shaft (Phase 1)																										
Tŷ Fodol Shaft (Phase 1)																										
Braint Shaft (Phase 2)																										
Tŷ Fodol Shaft (Phase 2)																										
Tunnelling (including tunnel cleanout)																										

Table 4.5 High Level Construction Programme

Year	2020			2021				2022				2023				2024				2025				2026		
Quarter	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
Braint Tunnel Head House																										
Tŷ Fodol Tunnel Head House																										
Cable installation																										
Braint Cable Sealing End Compound																										
Tŷ Fodol Cable Sealing End Compound																										
Site Reinstatement																										
Overhead Line																										
Installation of Penmynydd Road Construction Compound																										
Installation of Pentir Construction Compound																										

Table 4.5 High Level Construction Programme

Year	2020			2021				2022				2023				2024				2025				2026		
Quarter	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
Installation of bellmouths and temporary access tracks									■	■	■	■	■	■	■	■										
Section A Pylon Construction													■	■	■	■										
Section A Stringing															■	■	■	■								
Section B Pylon Construction													■	■	■	■	■	■	■							
Section B Stringing															■	■	■	■	■							
Section C Pylon Construction													■	■	■	■	■	■	■	■						
Section C Stringing															■	■	■	■	■	■	■	■	■	■		
Section D Pylon Construction																■	■	■	■	■	■	■	■			
Section D Stringing																				■	■	■	■	■		
Section E Pylon Construction																■	■	■	■	■	■	■	■			
Section E Stringing																				■	■	■	■	■		
Section F Pylon Construction																■	■	■	■	■	■	■	■			
Section F Stringing																				■	■	■	■	■	■	
Reinstatement																					■	■	■	■	■	■
Wylfa Substation																										

Table 4.5 High Level Construction Programme																										
Year	2020			2021				2022				2023				2024				2025				2026		
Quarter	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
Mobilisation																										
Substation works																										
Commissioning																										
Pentir Substation																										
Mobilisation																										
Substation works																										
Reinstatement																										

2.10 WORKFORCE NUMBERS

2.10.1 The following images illustrate the number of workers for each element of the Proposed Development over the construction programme.

Image 4.2 Workforce profile for Scenario 1, Scenario 2 and Scenario 3

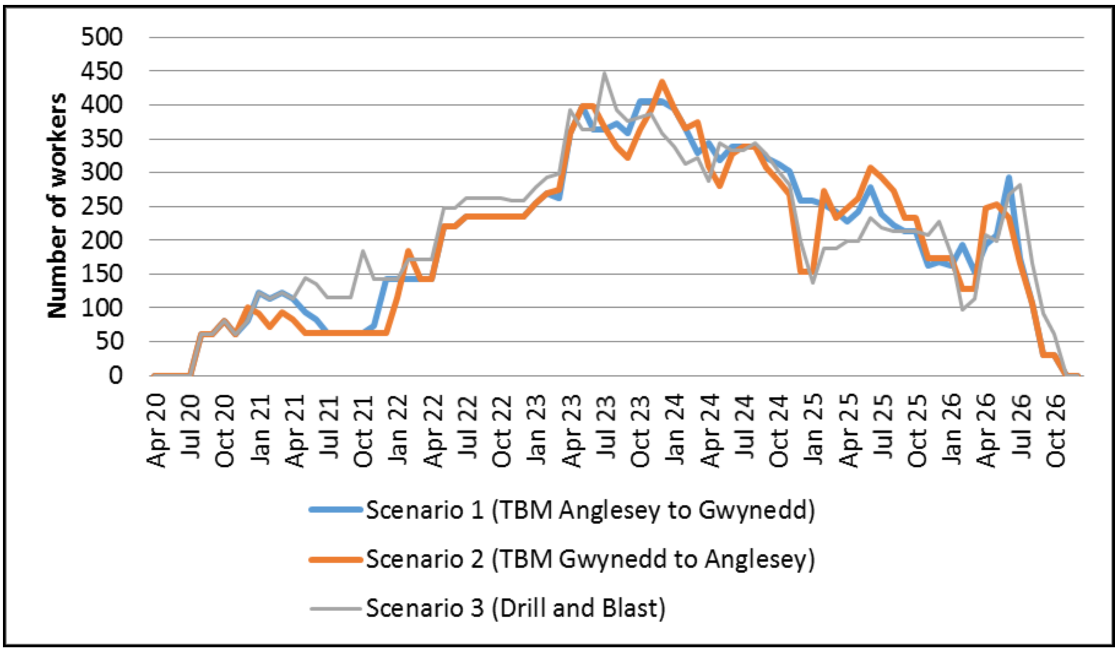


Image 4.3 Construction programme (Scenario 1)

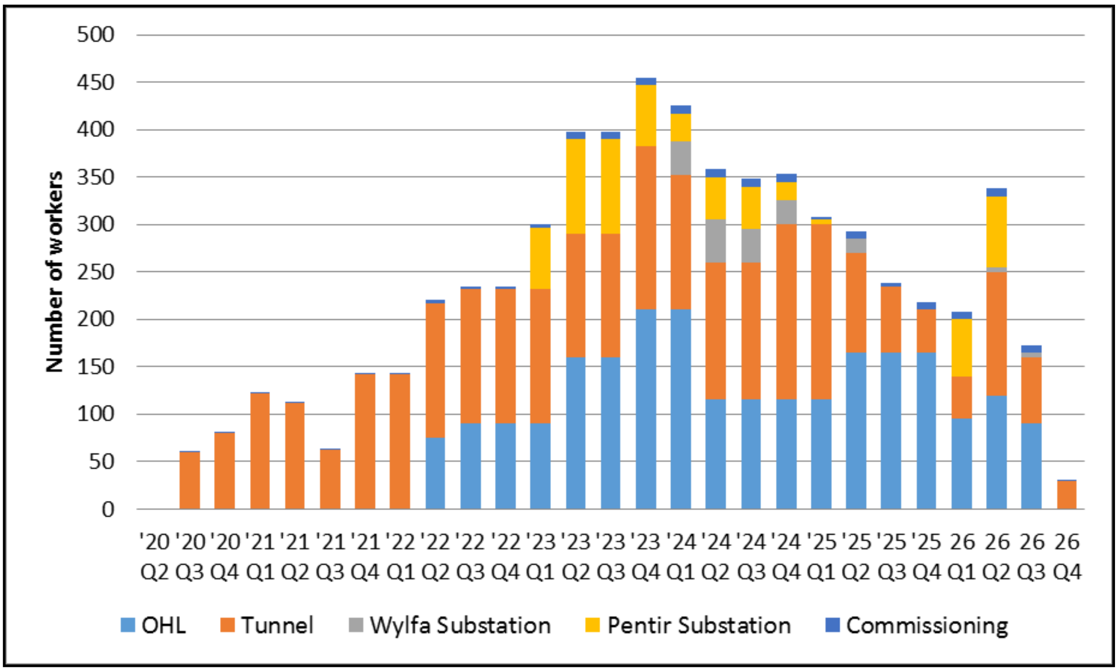


Image 4.4 Construction programme (Scenario 2)

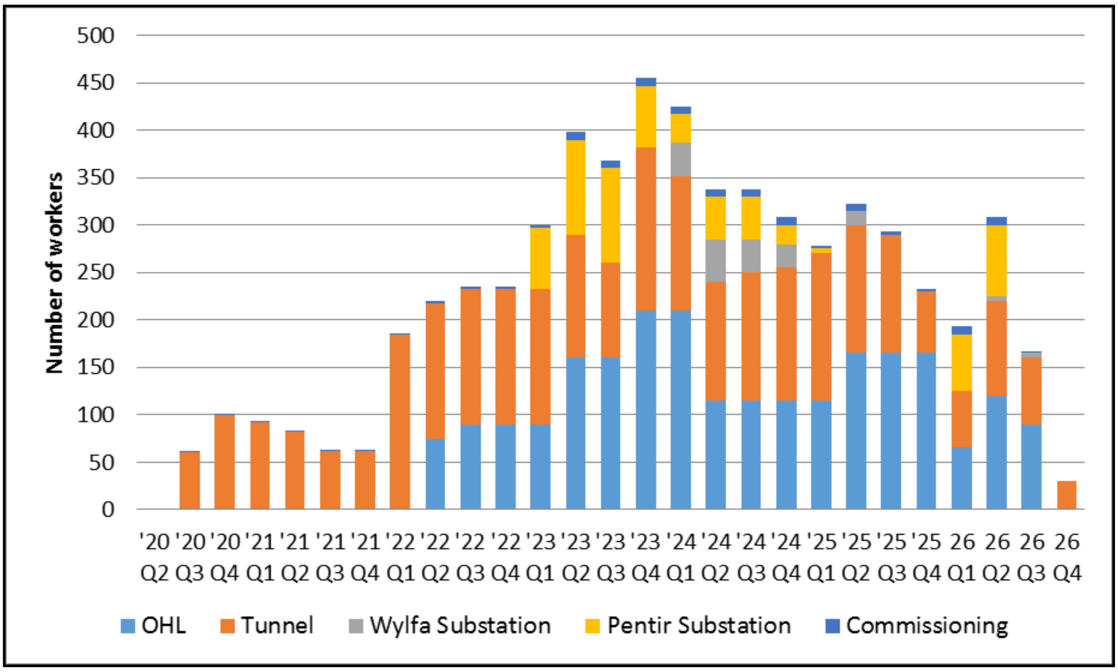
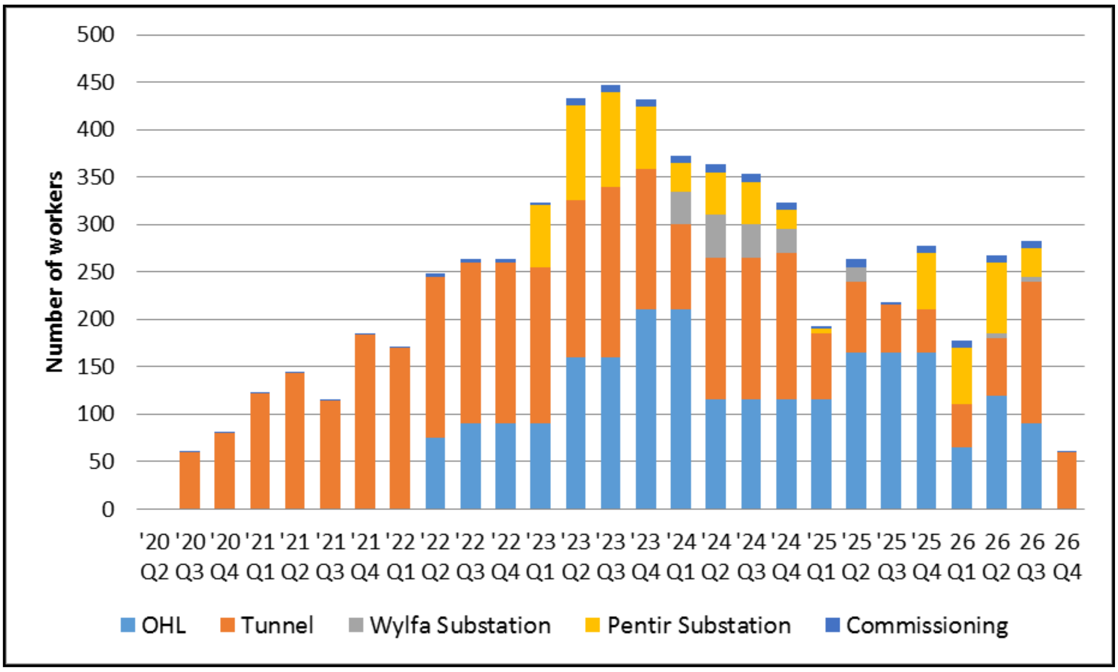


Image 4.5 Construction programme (Scenario 3)



2.11 REINSTATEMENT

2.11.1 All temporary working areas and accesses would be removed when construction of that stage of the works had been completed. Plant, temporary cabins and vehicles would be removed from the site. Save for the actual Proposed Development and works forming part thereof, and also anything associated (e.g. ground strengthening) all temporary land, including highways and public rights of way crossed by the works or other land temporarily occupied, would be made good in consultation with landowners and/or the relevant highways authority. Reinstatement would be in accordance with the Indicative Reinstatement Plans (**Document 7.4.1.1**).

3 Maintenance and Operation

3.1 INTRODUCTION

3.1.1 This section describes how the elements of the Proposed Development will be operated and maintained.

3.2 OVERHEAD LINE

Operation

3.2.1 During operation the 400 kV OHL would transmit electricity from Wylfa Substation to Pentir Substation.

Maintenance

3.2.2 The 400 kV OHL would be subject to annual inspection from the ground or by helicopter. The inspection would identify if there are any visible faults or signs of wear and would also indicate if changes in plant or tree growth or development had occurred that could risk infringing safety clearances. Inspections would provide input as to when refurbishment was required.

3.2.3 The 400 kV OHL could support telecommunication equipment such as small mobile telephone antennae and would contain optical fibres within the earthwire.

3.2.4 Independent companies would require access for maintenance purposes using pickup trucks and vans. Access for the optical fibres will usually be at the joint box positions located just above the anti-climbing devices on certain pylons. Position and frequency of joint boxes is subject to design by the successful contractor.

3.2.5 Access for vegetation management, telecommunications and fibre optic maintenance would be along routes agreed with the landowners and may require interlocking track mat panels.

3.2.6 The 400 kV OHL would be made up of a variety of materials, including concrete and steel for the foundations, steelwork for the pylon and aluminium for the conductors. All these materials have an expected lifespan, which would vary depending on how the 400 kV OHL was used and where it is located. Typically, pylon steelwork and foundations have a life expectancy of approximately 80 years, the conductors have a life expectancy of approximately 40 to 60 years and the insulators and fittings have a life expectancy of approximately 25 to 40 years. The lifespan of the 400 kV OHL may be longer than the anticipated 80 years, depending on its condition, the environment to which it is exposed, refurbishments and transmission network requirements.

3.2.7 Minor repairs or modifications may be required from time to time for local earthwire damage, addition of jumper weights, local conductor damage, broken insulator units, damaged or broken spacers, broken or damaged vibration dampers, damaged or broken anti climbing guards. Minor repairs would be programmed locally by a maintenance team using pickup trucks and vans to access site along routes agreed with landowners. Access may require interlocking track mat panels.

Refurbishment

3.2.8 Refurbishment work would be undertaken typically on one side of the pylon at a time, so that the other side could be kept ‘live’ or in use.

3.2.9 Refurbishment work could involve:

- the replacement of conductors and earth wires;
- the replacement of insulators and steelwork that holds the conductors and insulators in place, insulator fittings and conductor fittings;
- painting or replacement of the pylon steelwork and
- replacement of telecommunication equipment (by separate companies).

3.2.10 During refurbishment there would be activity along the 400 kV OHL, especially at tension pylons when a new conductor is installed and an old conductor taken down.

3.2.11 Vans would be used to carry workers in and out of the site and trucks would be used to bring new materials and equipment to site and remove old equipment. Temporary works including access tracks and scaffolding to protect roads may be required as for construction.

3.3 CABLE TUNNEL

Operation

3.3.1 The tunnel would be unmanned during normal operation. Ventilation fans located within the Tŷ Fodol Tunnel Head House would draw air through the tunnel in order to maintain the required temperature in the shafts and tunnel to ensure the cables did not overheat.

3.3.2 The tunnel ventilation fans would operate according to tunnel cooling demand. During normal operating conditions the fans would be expected to operate as follows:

- one or both fans working concurrently towards their peak capacity would only occur during emergency conditions or during testing;
- during normal operation, the tunnel ventilation fans would be operating in a duty/standby arrangement, with only one tunnel ventilation fan operating at any one time; and
- during normal operation, the circuit loadings would be shared between the cables on the new connection and the existing connection, meaning that the duty fan would not be required to operate towards its peak capacity.

3.3.3 It is therefore expected that a typical operating condition would consist of one tunnel ventilation fan operating up to 50% of peak capacity, assisted by natural ventilation and the tunnel's thermal inertia. During this time the other tunnel ventilation fan would be on standby. This condition could occur at any period during the day or night for extended periods of time.

3.3.4 During operation the tunnel would also be cleared regularly as required of excess water using sump pumps.

Maintenance

3.3.5 The cables in the tunnel would be subjected to maintenance inspections over the length of the tunnel comprising at least one annual inspection. The inspection would report on any defects or changes, identifying any additional requirements such as repairs/replacements. The tunnel ventilation fans and staircase fans would be run prior to entry until the shafts and tunnel are safe to enter by personnel. Whilst the tunnel ventilation fans would run during normal operation it is anticipated that the stairwell fans would only operate when personnel are using the stairwells.

3.3.6 It is anticipated the ventilation fans would be tested on a monthly basis. This would likely occur during the day and each fan would be manually run up to 100% for a short period of time.

3.3.7 For routine maintenance activities tunnel would be accessed via the permanent access roads at Braint and Tŷ Fodol THH/CSEC.

Refurbishment

3.3.8 Any replacements of cables within the tunnel, or larger equipment within the tunnel head houses, would require a temporary construction compound in proximity to the Tunnel Head House, the exact size of which would depend on a number of factors. Access would be gained via the permanent access road, subject to a 1 in 40 year maintenance or unplanned event. At Braint this would be via the permanent access road, at Tŷ Fodol this would be taken from bellmouth F4 as illustrated on Figure 4.1 (**Document 5.4.1.1**). Should this access be required a temporary access track would be installed and the land reinstated on completion of the works. At the end of their life expectancy (approximately 40 years) the cables would require replacing, assuming the connection was still required. If the old cables needed to be removed then a similar method could be followed as for installation of the cables within the completed tunnel.

3.4 TUNNEL HEAD HOUSES AND CABLE SEALING END COMPOUNDS

Tunnel Head Houses

Operation

3.4.1 The THHs would be unmanned during normal operation. The tunnel ventilation fans would operate as described in section 3.3 above.

Maintenance

3.4.2 Maintenance checks would be undertaken at regular intervals and would cover elements including the fans, lighting, pumps and gas detection. Where access to the shaft or tunnel was not required, the THH building would be inspected and maintained as per any National Grid Electricity Transmission System building.

Cable Sealing End Compounds

Operation

3.4.3 The CSEC would be unmanned during normal operation.

Maintenance

3.4.4 Maintenance activities would include infrequent visits to the CSECs to monitor the outdoor sealing end terminations and carry out periodic maintenance and checks on electrical equipment within the compound.

Refurbishment

3.4.5 When the Cable Sealing End required refurbishment and/or replacement works, vans would be used to carry workers in and out of the site and larger vehicles (possibly HGVs and small mobile cranes) would be used to bring new materials and equipment to site and remove old equipment. Temporary scaffolding may be required to protect any infrastructure around the compound.

3.5 SUBSTATIONS

Operation

3.5.1 The operation of the substations would continue to be operated as they are at present.

Maintenance

3.5.2 Maintenance of the substations would continue to be, undertaken on an ongoing basis with individual equipment subject to a three year maintenance cycle. Visual checks would be undertaken on a monthly inspection visit to the site.

Refurbishment

3.5.3 If the substations require refurbishment or replacement works, vehicles would be used to carry workers in and out of site and suitable vehicles would be used to bring new materials and equipment to site and remove old equipment.

3.6 LANDSCAPING

3.6.1 Any reinstatement and landscape mitigation planting would be maintained until it was established and any tree or shrub planted as part of an approved mitigation planting scheme that, within a period of 5 years after planting, was removed, died or was seriously damaged or diseased, would be replaced in the first available planting season with a specimen of the same species and size as that originally planted.

4 Decommissioning

4.1 INTRODUCTION

4.1.1 This section describes how the various elements of the Proposed Development would be decommissioned.

4.2 OVERHEAD LINE

4.2.1 If the connection was no longer required and the 400 kV operating requirements allowed, one connection may be removed. A connection would need to remain to bring electricity onto Anglesey. Upon removal of one of the connections, much of the material would be taken for recycling. Similar access would be required as outlined for construction.

4.2.2 Fittings, such as dampers and spacers would be removed from the conductors. The conductors would be cut into manageable lengths or would be winched onto drums in a reverse process to that described for construction. The fittings would be removed from the pylons and lowered to the ground.

4.2.3 Each pylon would most likely be dismantled by crane, with sections cut and lowered to the ground for further dismantling and removal from site. Depending on the access and space available, it may be possible to cut the pylon legs and then pull the pylon to the ground using a tractor. The pylon could then be cut into sections on the ground. Unless there was a compelling need for removal of all the foundations, these would be removed to approximately 1.5 m deep and subsoil and topsoil reinstated.

4.3 TUNNEL & TUNNEL HEAD HOUSES

4.3.1 If the 4AP connection were no longer required, the underground cable would be decommissioned. Cables would be removed from the tunnel and the shafts either capped or backfilled. The THH and associated equipment could be removed and materials would be taken for recycling. The tunnel itself would remain in-situ. Should the site no longer be required for operational purposes the land would be reinstated to an appropriate end use.

4.4 CABLE SEALING END COMPOUNDS

4.4.1 Upon decommissioning any materials would be removed and taken for recycling. Should the site no longer be required for operational purposes the land would be reinstated to an appropriate end use.

4.4.2 Similar methods and equipment would be required for dismantling as outlined for construction above.

4.5 SUBSTATIONS

4.5.1 The lifespan of substation equipment is approximately 40 years. If the elements of either the Wylfa or Pentir substation that form part of the Proposed Development were no longer required, the equipment would be safely disconnected from the transmission system and carefully dismantled. Much of the material would be taken for recycling. Similar methods and equipment would be required for dismantling as for construction.