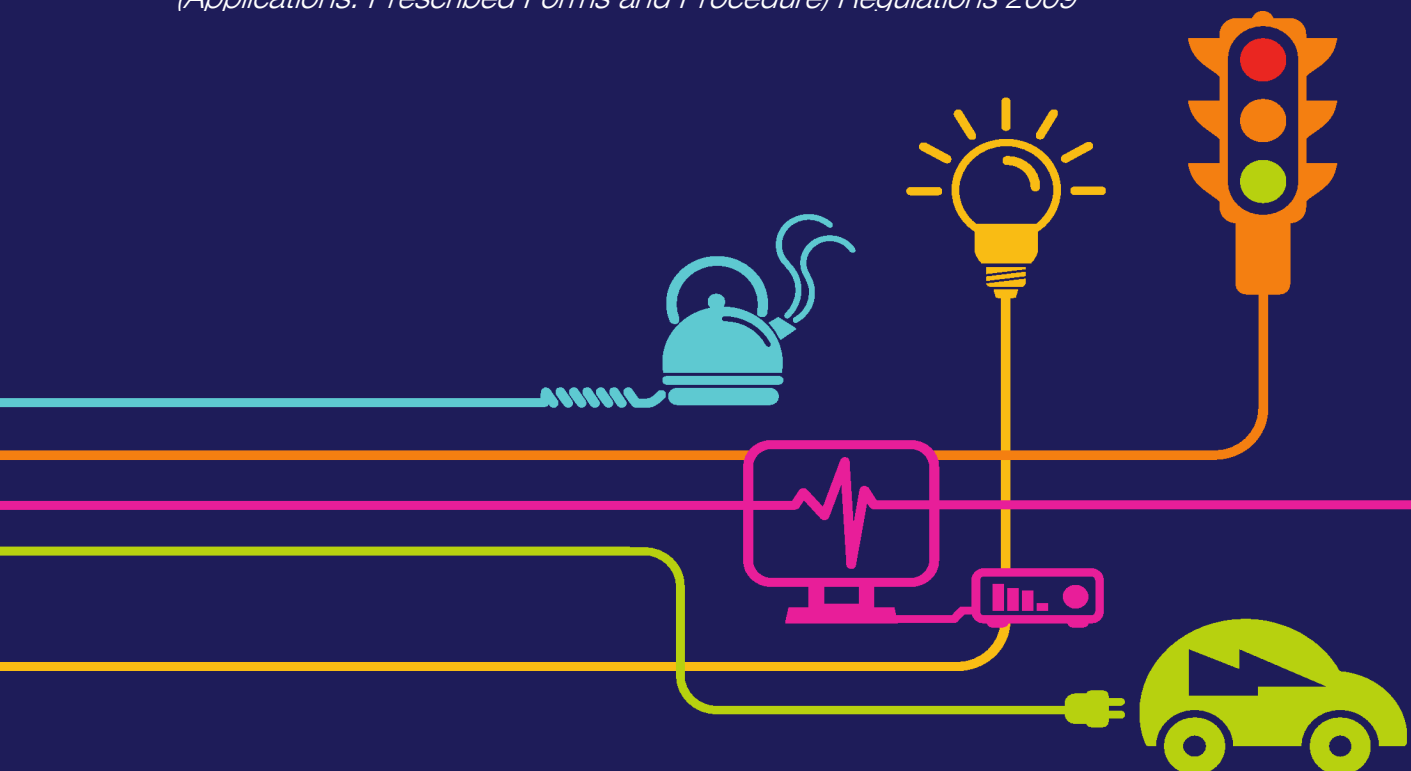


Environmental Statement

Chapter 2 – Alternatives and Proposed Development History

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





North Wales Connection Project

Volume 5

Document 5.2 Chapter 2 Alternatives and Proposed Development History Document

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Final September 2018

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1 Introduction

1.1 INTRODUCTION

- 1.1.1 This chapter summarises the history, the main alternatives considered and the evolution of the design of the Proposed Development, since its inception. It also provides a summary of the consultation work that has been undertaken, and the main ways in which this has influenced the Proposed Development as presented.

1.2 LEGAL AND POLICY BACKGROUND

- 1.2.1 There is both a policy and legal need to report the main alternatives considered during the development of a project.

- 1.2.2 The National Policy Statement for Energy (EN-1) (Ref 2.1) states:

“Applicants are obliged to include in their ES, as a matter of fact, information about the main alternatives they have studied. This should include an indication of the main reasons for the applicant’s choice, taking into account the environmental, social and economic effects and including, where relevant, technical and commercial feasibility”

- 1.2.3 In addition Part 1 of Schedule 4 of the EIA Regulations (Ref 2.2) requires that the ES includes:

“18. An outline of the main alternatives studied by the applicant and an indication of the main reasons for the applicant’s choice, taking into account the environmental effects”.

- 1.2.4 This chapter therefore describes the evolution of the Proposed Development from the identification of the Strategic Options to the Proposed Development that is now subject to an application for a Development Consent Order (DCO), under Section 37 of the Planning Act 2008 (Ref 2.3).

1.3 OVERVIEW OF NATIONAL GRIDS APPROACH TO OPTIONS APPRAISAL AND ROUTING DECISION MAKING

- 1.3.1 National Grid is legally required to provide an efficient, economic and coordinated system of electricity transmission. Transmission infrastructure needs to be, and to remain, capable of transporting electricity from and to

customers, and maintaining a minimum level of security and supply. Under Section 9 of the Electricity Act 1989 (Ref 2.4 National Grid has a duty:

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

(b)to facilitate competition in the supply and generation of electricity.”

- 1.3.2 Schedule 9 of the Electricity Act 1989 requires National Grid, when formulating proposals for new lines and other works to:

“....have regard to the desirability of preserving natural beauty, of conserving flora, fauna, and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest; and 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”.

- 1.3.3 National Grid considers options for enhancing existing transmission infrastructure before options requiring wholly new transmission infrastructure. This is consistent with its statutory duty to have regard to amenity under Section 38 and Schedule 9 of the Electricity Act 1989, and promotes more sustainable development. This position is detailed in National Grid’s Stakeholder, Community and Amenity Policy (Ref 2.5).

- 1.3.4 In accordance with the Policy described above, National Grid will only propose to build new transmission infrastructure where existing infrastructure cannot be technically or economically upgraded to meet customer requirements and legal obligations. Where there is no viable existing upgrade option, National Grid will identify solutions and options that seek to achieve the most appropriate integration of its statutory and licence duties and obligations.

- 1.3.5 National Grid has published a document (Ref 2.6) that explains its approach to the design and routeing of new electricity transmission lines. This document sets out how, in principle, National Grid identifies the most appropriate location and technology for any new transmission route. The approach is then specifically tailored to the circumstances of each case.

Options Appraisal

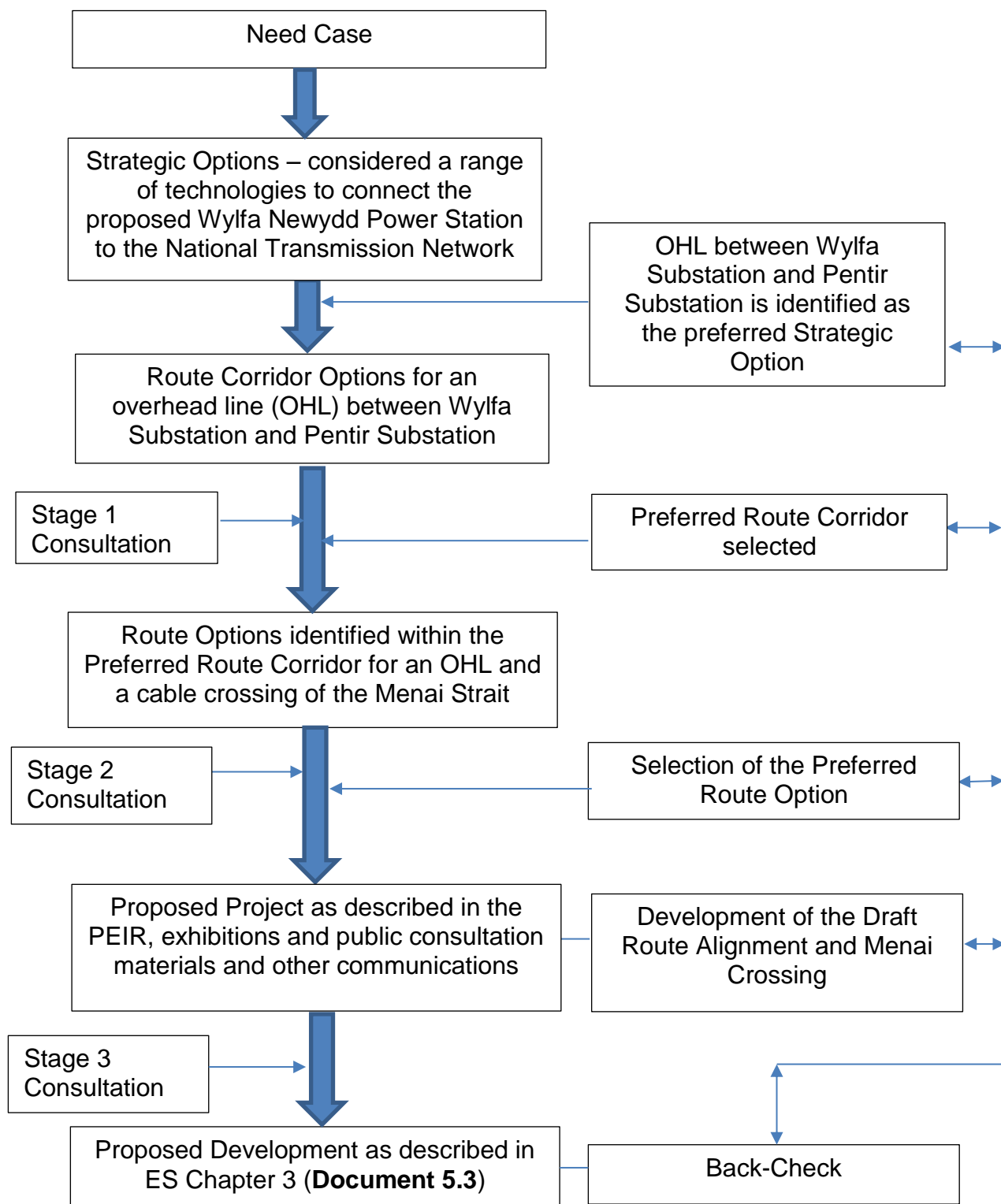
- 1.3.6 National Grid has also published a document (Ref 2.7) that explains the Option Appraisal process that is used to inform decision making in respect

of major infrastructure projects. The Options Appraisal process has been developed to provide a framework for the sensitive analysis of, and appropriate consultation. The Options Appraisal process considers environmental, socio-economic, technical and cost issues associated with each option being appraised, and then balances these factors, in combination with consultation feedback, when coming to a decision on a preferred option to take forward.

1.4 OVERVIEW OF THE EVOLUTION OF THE PROPOSED DEVELOPMENT

- 1.4.1 The following sections describe the evolution of the Proposed Development and Image 2.1 below summarises this process.

Image 2.1 Overview of the Proposed Development Evolution



1.5 SUPPORTING DOCUMENTS

- 1.5.1 The evolution of the design of the Proposed Development is set out in the Design Report (**Document 7.17**). Throughout the evolution of the Proposed Development a number of documents have been prepared to provide the basis for consultation and to demonstrate that National Grid have taken into account the consideration of various alternatives to achieve the connection, in deciding upon the Proposed Development. This chapter summarises those decisions and the documents listed in Table 2.1 should be referred to for more detailed information.

Table 2.1 Supporting Documents

Document	Description
Need Case (Document 7.1). The original Need Case was published in October 2012 (Document 9.7.1) it has subsequently been updated and republished in January 2015 (Document 9.7.2) and in 2016 (Document 9.7.3).	Explains why the Proposed Development is needed.
Strategic Options Report (Document 7.2). The original Strategic Options Report was published in October 2012 (Document 9.8.1) it has subsequently been updated and republished in January 2015 (Document 9.8.2) and in 2016 (Document 9.8.3).	Explains about the connection options.
Wylfa to Pentir Initial Route Corridor Identification Report, October 2012 (Document 9.1)	Examines and identifies the preliminary potential overhead line (OHL) broad route corridors between Wylfa and Pentir.
Summary of Important Project Changes and Updates, January 2015 (Ref 2.8).	Explains the important changes that occurred since October 2012 which required a review of the selection of the preferred strategic option which was reflected in the January 2015 version of the Strategic Options Report.

Table 2.1 Supporting Documents

Document	Description
Wylfa to Pentir Preferred Route Corridor Selection Report, October 2015 (Document 9.2).	Provides information about how the preferred route corridor was selected.
Wylfa to Pentir Route Options Report, October 2015 (Document 9.3).	Explains how the route options within the preferred route corridor were identified.
Preferred Route Option Selection Report Wylfa to the Menai Crossing Area, September 2016 (Document 9.4).	Explains how the preferred route for the new electricity transmission line was identified.
Draft Route Alignment Report Wylfa to the Menai Crossing Area September 2016 (Document 9.5).	Explains the design rationale for a substantive part of the new electricity transmission connection.
Menai Strait Crossing Report September 2016 (Document 9.6).	Identifies the preferred option for crossing the Menai Strait with a new 400 kilovolt (kV) connection.

1.6 CONSULTATION TO DATE

- 1.6.1 Consultation and stakeholder engagement has been a major contributing factor in the evolution of the Proposed Development; this allowed consultees and stakeholders to influence principal decisions and the design.
- 1.6.2 The consultation process for the North Wales Connection Project consisted of three main stages, including two stages of non-statutory consultations. Consultation feedback alongside environmental, technical, socio-economic and cost appraisals has been used to inform the Proposed Development as summarised in this chapter.

Stage 1 Consultation – Route Corridor Options

- 1.6.3 The Stage 1 Consultation ran from the 3 October 2012 to the 18 January 2013 and consulted on strategic options, the preferred strategic connection option and route corridor options.

Stage 2 Consultation – Route Options

- 1.6.4 The Stage 2 Consultation ran from the 21 October 2015 to 16 December 2015 and consulted on route options within the preferred (orange) route

corridor. Consultation also focused upon search areas for the cable sealing end compounds required for an underground crossing at the Menai Strait and Area of Outstanding Natural Beauty (AONB).

Stage 3 Consultation – Proposed Project

- 1.6.5 The statutory Stage 3 Consultation was held from the 5 October 2016 to the 16 December 2016 and consulted on the detailed proposals including pylon locations, the location of the tunnel underneath the Menai Strait, proposed extensions to Wylfa and Pentir Substations and associated infrastructure such as the Tunnel Head Houses (THH), Cable Sealing End Compounds (CSEC) and construction compounds.

Ongoing Engagement

- 1.6.6 In addition to the statutory and non-statutory consultation periods, National Grid has had ongoing engagement with the statutory stakeholders such as Welsh Government, Isle of Anglesey County Council (IACC), Gwynedd Council, Natural Resources Wales (NRW) and Cadw, as well as non-statutory stakeholders as appropriate. Engagement specific to the Environmental Impact Assessment is set out in Chapter 5 EIA Consultation (**Document 5.5**) and other engagement is set out in the Consultation Report (**Document 6.1**).

2 Do Nothing Scenario

2.1 INTRODUCTION

- 2.1.1 National Grid assessed whether there was sufficient capacity available in the existing transmission system in North Wales to accommodate the changes resulting from new customer connections. From the assessment, National Grid forecasted that without reinforcement, the transmission system would not be compliant with the National Electricity Transmission System Security and Quality of Supply Standard (NETS SQSS) (Ref 2.9) from 2026 onwards. The NETS SQSS is a document that sets out certain criteria with which National Grid must comply in planning, developing and operating the transmission system. 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**).
- 2.1.2 Therefore a 'do nothing' scenario is not possible to ensure a compliant transmission system and would result in National Grid being in breach of the terms of their transmission licence.

3 Strategic Options

3.1 INTRODUCTION

- 3.1.1 Strategic options are the starting point for any project. It is at this stage that the widest range of potential solutions are considered for assessment based upon high level design information.
- 3.1.2 The following sections provide a summary of the strategic options considered, however the Strategic Options Report (**Documents 7.2, 9.8.1, 9.8.2 and 9.8.3**) should be referred to for full details.
- 3.1.3 National Grid identified and consulted on a range of options for locations where the generation from the proposed Wylfa Newydd Power Station could be connected to the National Electricity Transmission System, and how that generation might be transmitted there.
- 3.1.4 Each potential Strategic Option was initially assessed by National Grid, to ensure that the option would meet the reinforcement need and that the resultant transmission system would comply with the minimum standards defined in the National Electricity Transmission System Security and Quality of Supply Standards (NETS SQSS). Potential Strategic Options which did not meet the reinforcement need or otherwise did not meet the standards set out in the NETS SQSS were discounted.
- 3.1.5 Six strategic options were identified for the reinforcement of the electricity transmission system in North Wales. National Grid considered that each of these options would be able to meet the additional transmission system requirements in North Wales and took these options forward for strategic option appraisals. These were:
- Option 1 - Two subsea cable circuits between Wylfa and Connah's Quay Substations;
 - Option 2 - One subsea circuit between Wylfa and Connah's Quay Substations and one Direct Current (DC) subsea cable circuit between Wylfa and Pembroke;
 - Option 3 – Two new onshore circuits connecting Wylfa Substation and Pentir Substation, one new alternating current (AC) circuit between Pentir Substation and Trawsfynydd Substation to be installed on existing pylons, a new connection between Wern and Y Garth CSECs,

a new substation in west Gwynedd, re-conductoring of existing circuits in North Wales and modifications at existing substations;

- Option 4 – Two new offshore circuits east of Anglesey connecting Wylfa Substation and Pentir Substation, one new AC circuit between Pentir Substation and Trawsfynydd Substation to be installed on existing pylons, a new connection between Wern and Y Garth CSECs, a new substation in west Gwynedd, re-conductoring of existing circuits in North Wales and modifications at existing substations;
- Option 5 – Two new offshore circuits west of Anglesey connecting Wylfa Substation and Pentir Substation, one new AC circuit between Pentir Substation and Trawsfynydd Substation to be installed on existing pylons, a new connection between Wern and Y Garth CSECs, a new substation in west Gwynedd, re-conductoring of existing circuits in North Wales and modifications at existing substations; and
- Option 6 – Replacement of the existing 132 kV OHL between Wylfa Substation and Valley Substation with a 400 kV OHL, two new circuits (largely offshore) between Valley and a new substation in the vicinity of west Gwynedd, one new AC circuit between Pentir and Trawsfynydd to be installed on existing pylons, a new connection between Wern and Y Garth CSECs, re-conductoring of existing circuits in North Wales and modifications at existing substations.

3.1.6 Strategic Option 6 was not included in the first version of the Strategic Options Report, published in 2012 (**Document 9.8.1**). It was added in 2015 (**Document 9.8.2**) following feedback from stakeholders received during the Stage One Consultation.

3.1.7 The following section provides more detail about the strategic options that were considered.

Strategic Option 1

3.1.8 Strategic Option 1 consisted of approximately 106 km of subsea and onshore cable circuits between the Wylfa and Connah's Quay 400 kV substations, this is illustrated on Image 2.2.

Image 2.2 Geographical Illustration of Strategic Option 1



Strategic Option 2

- 3.1.9 Strategic Option 2 consisted of approximately 106 km of subsea cable between Wylfa and Connah's Quay 400 kV substations and the further installation of approximately 231 km of subsea cable between Wylfa and Pembroke, this is illustrated on Image 2.3.

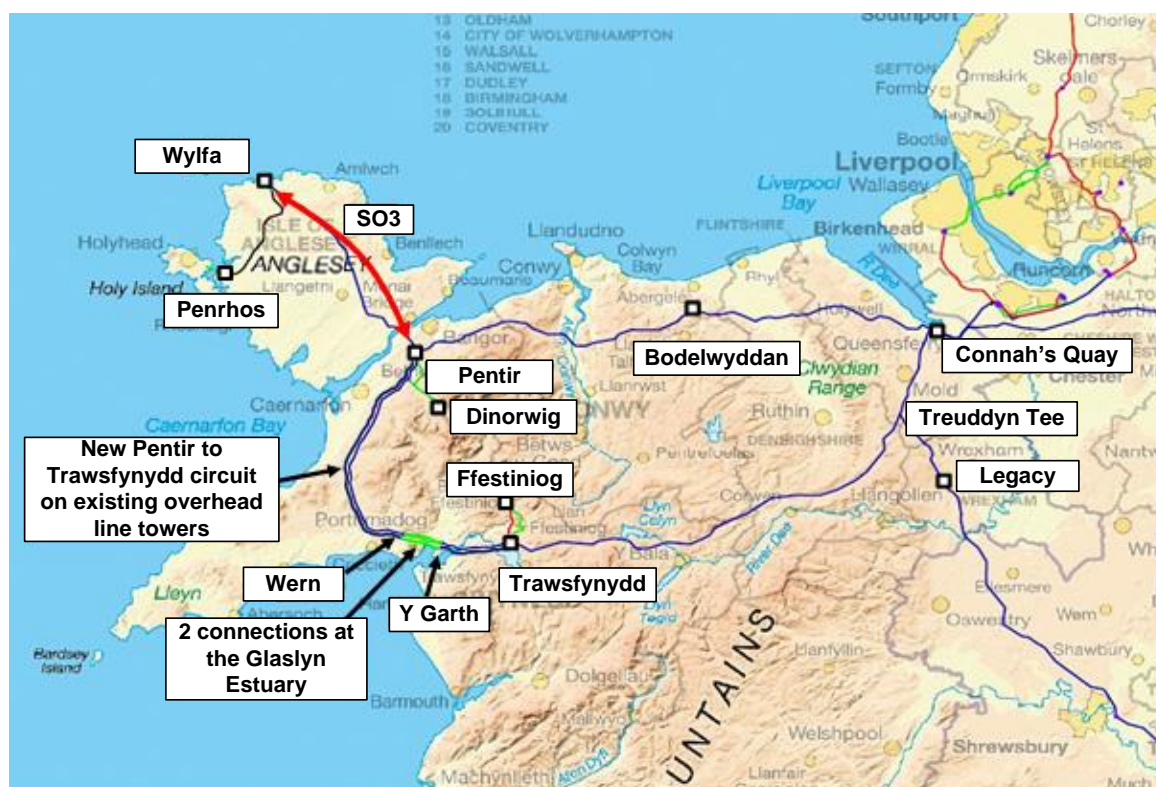
Image 2.3 Geographical Illustration of Strategic Option 2



Strategic Option 3

- 3.1.10 Strategic Option 3 consisted of approximately 40 km of onshore circuits between Wylfa Substation and Pentir Substation and is illustrated on Image 2.4. The option would also include an onshore circuit between Pentir Substation and Trawsfynydd Substation on existing pylons, a new connection between Wern and Y Garth CSECs, new substation in west Gwynedd and reconductoring of existing circuits in North Wales.;

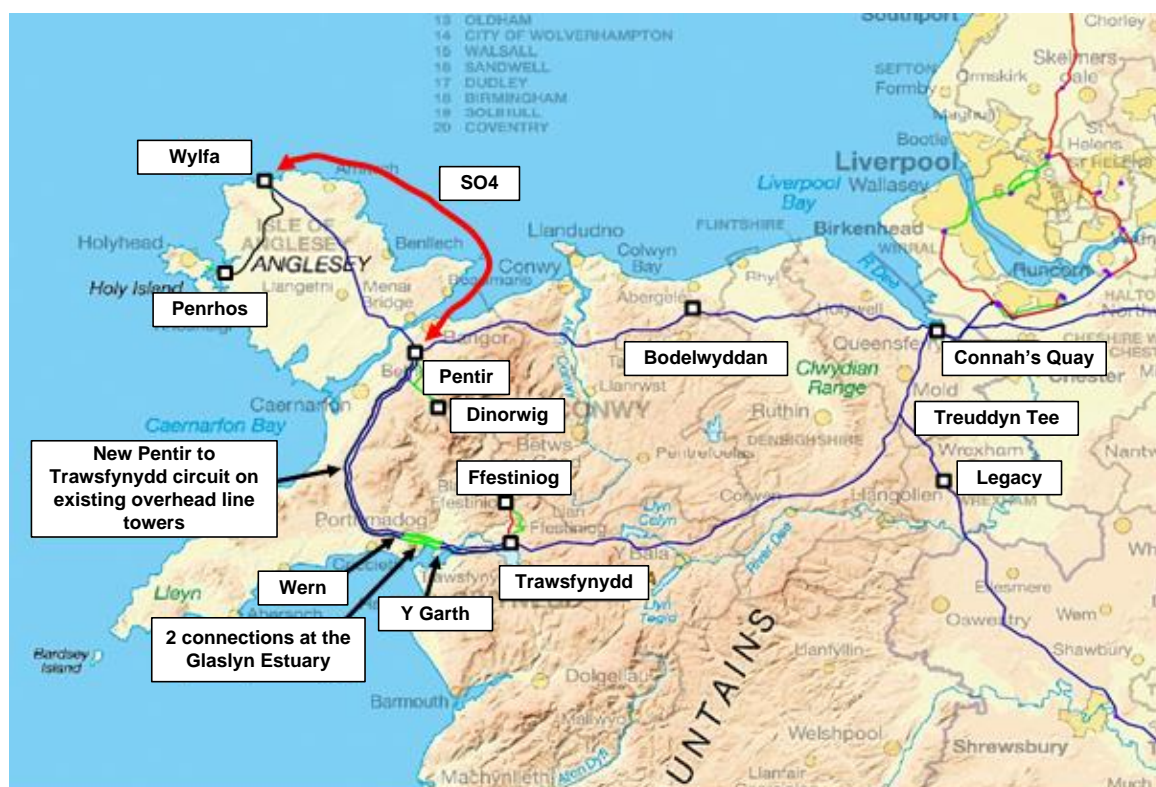
Image 2.4 Geographical Illustration of Strategic Option 3



Strategic Option 4

- 3.1.11 Strategic Option 4 consisted of approximately 64 km of offshore cable circuits between Wylfa and Pentir off the east coast of Anglesey, as illustrated on Image 2.5. The option would also include an onshore circuit between Pentir Substation and Trawsfynydd Substation on existing pylons, a new connection between Wern and Y Garth CSECs, new substation in west Gwynedd and reconductoring of existing circuits in North Wales.

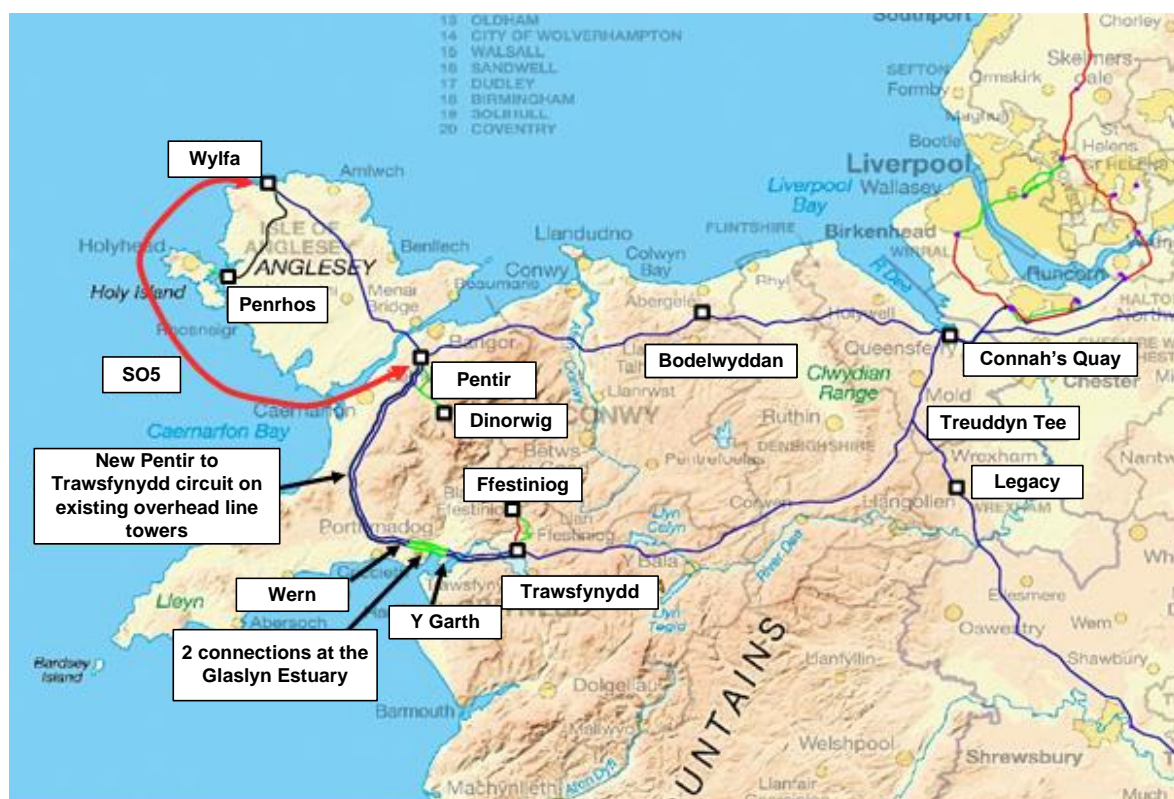
Image 2.5 Geographical Illustration of Strategic Option 4



Strategic Option 5

3.1.12 Strategic Option 5 consisted of approximately 80 km of offshore cable circuits between Wylfa Substation and Pentir Substation located off the west coast of Anglesey, as illustrated on Image 2.6. The option would also include an onshore circuit between Pentir Substation and Trawsfynydd Substation on existing pylons, a new connection between Wern and Y Garth CSECs, new substation in west Gwynedd and reconductoring of existing circuits in North Wales.

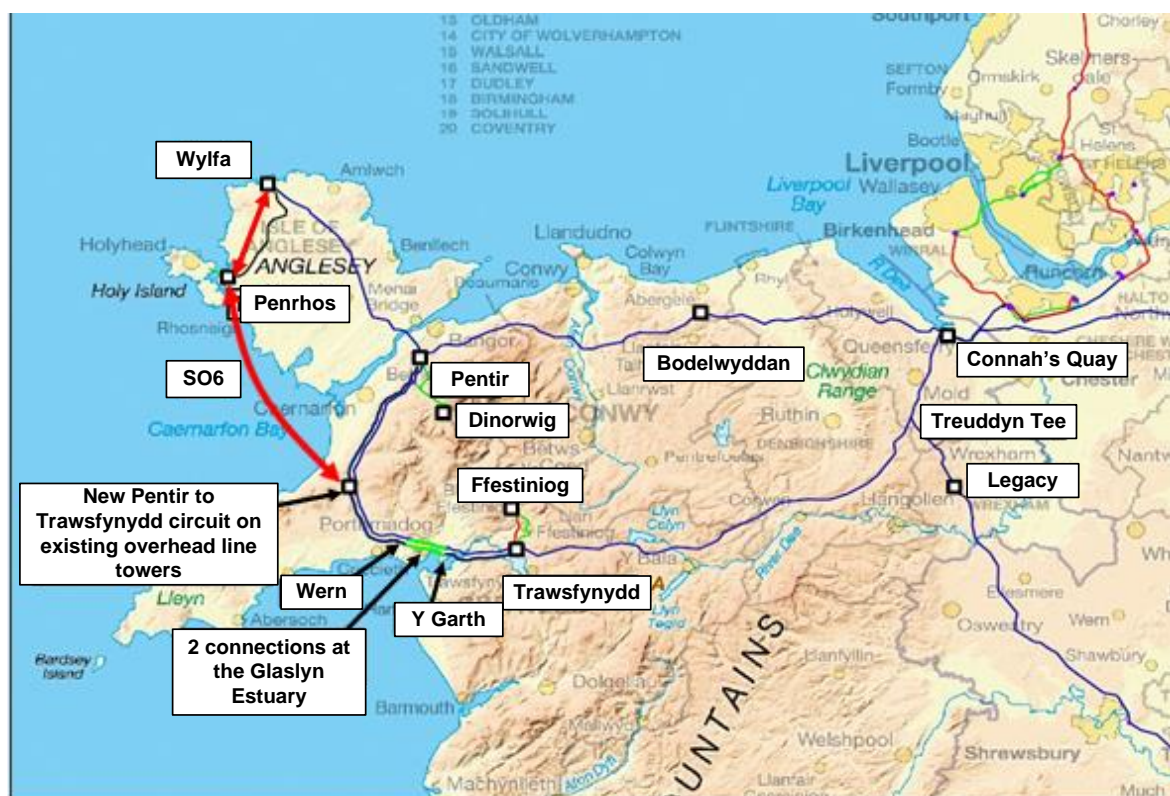
Image 2.6 Geographical Illustration of Strategic Option 5



Strategic Option 6

3.1.13 Strategic Option 6 consisted of approximately 18 km of onshore circuits between Wylfa Substation and the vicinity of Valley (replacing an existing 132 kV route), approximately 30 km of offshore circuits and 8 km of onshore circuits between Valley and a new substation in west Gwynedd. This is illustrated on Image 2.7. The option would also include an onshore circuit between Pentir Substation and Trawsfynydd Substation on existing pylons, a new connection between Wern and Y Garth CSECs, new substation in west Gwynedd and reconductoring of existing circuits in North Wales.

Image 2.7 Geographical Illustration of Strategic Option 6



3.1.14 An assessment of each of the six Strategic Options was undertaken based on the following criteria:

- technology;
- cost;
- ecology and biodiversity;
- cultural heritage, landscape and visual;
- other environmental considerations;
- consideration of combined environmental topics; and
- socio-economic (economic activity, people and communities).

3.1.15 Following the strategic options appraisal (**Document 9.8.2**) it was concluded that Strategic Option 3 consisting of new OHL circuits connecting Wylfa and Pentir Substations (potentially with appropriate mitigation, including the use of underground technologies) was the best option to achieve an appropriate balance between National Grid's technical, economic, amenity and environmental obligations.

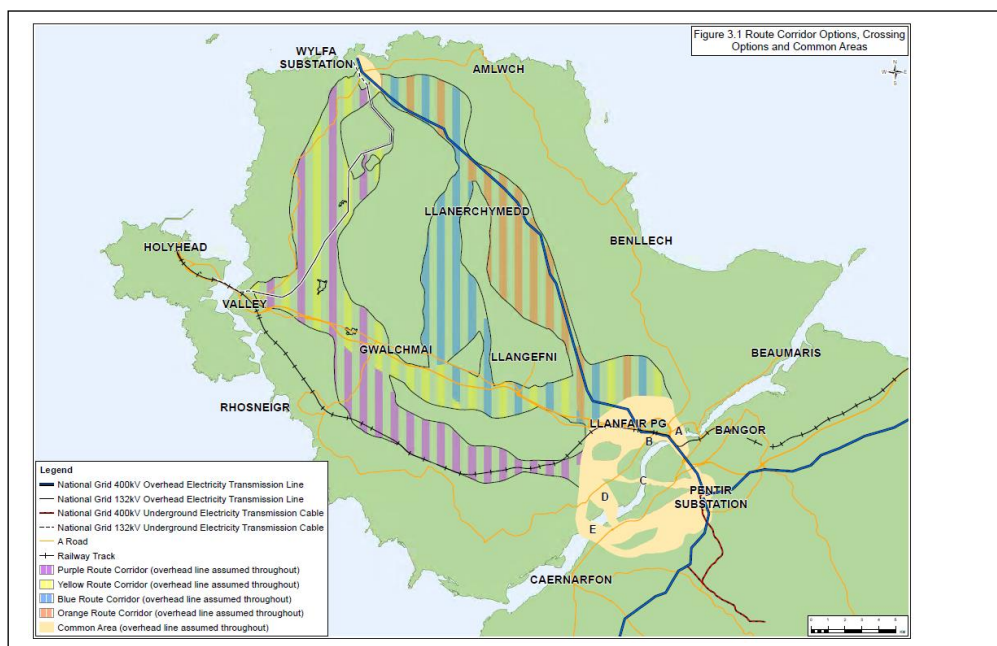
- 3.1.16 National Grid took forward Strategic Option 3 to the next stage of the appraisal. The next stage of the appraisal sought to identify a suitable potential route corridor for the connection, including locations where the use of underground cables might be appropriate.

4 Route Corridor Identification and Selection

4.1 IDENTIFYING THE ROUTE CORRIDORS

- 4.1.1 Following selection of the preferred strategic option, National Grid identified potential broad route corridors for a new 400 kV OHL between Wylfa and Pentir, using desk-based study, supplemented by specialist surveys of 'baseline' environmental, socio-economic and technical data within the study area. The baseline data was reviewed to identify features or sensitive sites that had the potential to pose significant constraints to the development of a new connection (e.g. location of large residential areas, conservation sites or other developments such as wind farms).
- 4.1.2 From this review, four potential broad route corridors were identified that either avoided or reduced potential effects associated with these constraints; in addition, five possible locations for crossing the Anglesey AONB and Menai Strait were identified. Each of the four broad route corridors could be connected to each of these crossing points through an area common to the route corridors (known as the Common Area). Taking account of the data and assessments available at that time, a preliminary conclusion was reached that a transmission connection could be achieved with a fully OHL connection between Wylfa and Pentir. The route corridors identified are summarised below and a full description of each is presented in the North Wales Connection Project Wylfa to Pentir Overhead Electricity Line – Route Corridor Identification Report, October 2012 (**Document 9.1**).
- 4.1.3 Image 2.8 illustrates the four route corridors and the 'Common Area'.

Image 2.8 Route Corridor Options



Orange Route Corridor

- 4.1.4 The Orange Route Corridor was approximately 24 km in length and was broadly based on the route of the existing 400 kV OHL as it runs from the existing Wylfa Substation to Pentir Substation, presenting the option to run parallel with the existing connection.

Blue Route Corridor

- 4.1.5 The Blue Route Corridor was approximately 28 km in length and presented an option to avoid paralleling the majority of the existing 400 kV and 132 kV OHLs. It ran generally through open countryside in the centre of the island before turning east to follow the A55 corridor to the South Common Area.

Yellow Route Corridor

- 4.1.6 The Yellow Corridor was approximately 29 km in length and this presented an option to route a line to the west of the island. It largely mirrored the direction of the existing 132 kV OHL and A5025 that runs along the west of the island down to the area near Valley and the A55. At that point the route corridor followed the line of the A55 and A5 to the Menai Strait.

Purple Route Corridor

- 4.1.7 The Purple Corridor was approximately 33 km in length and, similar to the Yellow Corridor, this presented an option to route the OHL to the west of the island before turning east within a corridor between the coast and the A55.

Menai Strait Crossing Options

- 4.1.8 Five corridors were identified to cross the Menai Strait and connect to Pentir Substation. Each of the crossing options connected to a Common Area, which in turn linked to the four route corridor options described above.

Crossing Option A

- 4.1.9 Crossing Option A ran between the settlements of the Menai Bridge and Llanfairpwll, across the Menai Strait east of Britannia Bridge and then travelled south-east to Pentir Substation.

Crossing Option B

- 4.1.10 Crossing Option B ran from the south-west of Llanfairpwll, across the Menai Strait west of Britannia Bridge and then travelled south-east to Pentir Substation.

Crossing Option C

- 4.1.11 Crossing Option C ran east from Llanedwen crossing the Menai Strait north of Y Felinheli. It continued east across the A487 before turning south to reach Pentir Substation.

Crossing Option D

- 4.1.12 Crossing Option D ran from Ysgubor Fawr south before crossing the Menai Strait and reaching the mainland between the National Outdoor Pursuits Centre and Llanfair Hall. It then headed to the north-east, north of Bethal, towards Pentir Substation.

Crossing Option E

- 4.1.13 Crossing Option E began north-east of Brynsiencyn before running south to the Menai Strait. It crossed the Menai Strait in an easterly direction meeting the mainland close to a sewerage works. This option then split, with one corridor option running north of Bethel and another running to the south, before merging east of Bethel and heading north-east towards Pentir Substation.
- 4.1.14 Whilst all four corridors were able to connect to any one of the five identified crossing points through the Common Area, each of the route corridors were more closely related to certain crossing points. Dependent upon the combination of route corridor and crossing option, the overall route corridor length between Wylfa and Pentir varied between approximately 35 km and 55 km.

Route Corridor Appraisal

4.1.15 The following topics were considered during the appraisal of each route corridor as those likely to provide a significant differentiator for a high level comparison of route corridor options:

- environmental:
 - landscape and visual;
 - historic environment; and
 - ecology.
- socio-economic:
 - local economy;
 - tourism; and
 - aviation and defence.
- technical; and
- cost.

4.1.16 The selection of the preferred route corridor aimed to balance these considerations and was based upon a qualitative review of the appraisal findings.

4.2 PREFERRED ROUTE CORRIDOR

4.2.1 Following a review of consultation feedback and differentiators between the route corridors, it was determined that the Orange Route Corridor was the preferred route corridor to be taken forward to develop a specific alignment and consent application as it provided an opportunity to significantly reduce the potential environmental impacts, when compared to the other route corridor options.

4.2.2 The detailed explanation for the preference of the Orange Route Corridor is set out in the Preferred Route Corridor Selection Report (**Document 9.2**) published in October 2015 and which is summarised below.

Landscape and Visual Amenity

4.2.3 The Orange Route Corridor was the shortest route, thus requiring fewer pylons, and offered the opportunity to develop within an area already affected by an existing OHL.

4.2.4 The terrain in the Orange Route Corridor offered better natural screening and compliance with the Holford Rules (Ref 2.10) compared to the more

expansive, long distance views of the Yellow and Purple Route Corridors. Computer modelling indicated that fewer new visual amenity receptors were likely to be affected along the Orange Route Corridor compared with other route corridors.

4.2.5 The Yellow and Purple Route Corridors were also visible from long lengths of the Anglesey AONB, whilst there was less visibility of the Orange and Blue Route Corridors from the AONB.

4.2.6 Any new OHL within the Blue, Yellow and Purple Route Corridors would have affected undeveloped landscapes and would be more likely to affect undeveloped landscapes and panoramic views to Snowdonia; in particular, the Blue and Yellow Route Corridors had the potential to affect views for tourists travelling eastwards along the A55, for example those entering Wales from Holyhead.

Ecology

4.2.7 The route corridor options were broadly similar in terms of their potential effects on flora and fauna, especially protected species. All options needed to cross the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay Special Area of Conservation (SAC). The Orange Route Corridor was preferred as it provided opportunities for a route that would avoid all other designated nature conservation sites, whilst the Blue, Yellow and Purple Corridors provided no opportunity for a route to avoid direct effects upon Malltraeth Marsh Site of Special Scientific Interest (SSSI), due to low flying zone constraints associated with RAF Mona.

Historic Environment

4.2.8 There were no potential effects on the historic environment that were considered to be differentiating factors between the route corridors.

Socio-economics (Local Economy)

4.2.9 All route corridor options contained sensitive tourist facilities and attractions, with most tourism receptors on the coast near the Menai Strait, these were common to all route corridors. Potential effects on tourism are often linked to landscape and visual amenity concerns. From a landscape perspective, the Orange Route Corridor was preferred as it was the shortest route, thus requiring fewer pylons and offered the opportunity to develop within an area already affected by an existing OHL.

Socio-economics (including Aviation and Defence)

- 4.2.10 The Blue and Yellow Route Corridors may have needed mitigation near RAF Mona in the form of two separate low height lines, whilst the Purple Route Corridor may also have required low height pylons depending on the final alignment. These risks were avoided by the Orange Route Corridor, which could avoid the need to manage risks of infringement of safeguarding zones, reinforcing the preference for the Orange Route Corridor.

Consultation Feedback

- 4.2.11 Where members of the public gave feedback on the route corridor options, the majority of the 153 responses (79%) preferred the Orange Route Corridor as it was the shortest, most direct route and allowed the existing OHL to be followed. Blue and Yellow Route Corridors were also highlighted due to the potential effects on views for tourists entering Wales along the A55 from Holyhead.

4.3 CROSSING OF THE AONB AND MENAI STRAIT

- 4.3.1 In January 2015 National Grid published information on its latest analysis which included a preference to use underground cables through the Anglesey AONB and across the Menai Strait, avoiding the development of an OHL within this sensitive area. This decision took account of consultation feedback from public and statutory stakeholders, together with a review of the requirements set out in National Policy Statement EN-5. It was considered that the additional cost associated with this mitigation was justified to reduce effects upon the landscape of the AONB and to protect iconic views along the Menai Strait. It was also considered that an OHL proposal in this area would be likely to conflict with national planning policy. Avoidance of the use of an OHL was the most appropriate way to fulfil National Grid's statutory duty to have regard to the conservation and enhancement of the AONB. It was considered that while technically difficult, a viable means to cross the Menai Strait using underground cables should be sought.
- 4.3.2 This important design decision in the evolution in the design of the proposed development represents significant Mitigation by Design. In particular, the substantial landscape and visual effects upon a nationally designated landscape that would have resulted from the development of any further OHL in the vicinity of the Menai Strait have been avoided. In addition, this design decision has also reduced potential environmental and socio-economic effects on other receptors in this area including, but not limited to:
- the Plas Newydd Grade I Listed Building;

- the Vaynol Registered Parks and Gardens; and
- communities in the vicinity of the Menai Strait.

5 Route Option Identification and Selection

5.1 WYLFA TO PENTIR ROUTE OPTIONS

- 5.1.1 National Grid identified and undertook a preliminary assessment of the possible environmental effects of the potential route options within the Orange Route Corridor, between Wylfa and the Menai crossing area, and on the Gwynedd side of the Menai Strait, to the Pentir Substation. The route options consisted of 100 metres (m) wide swathes of land that an OHL could be sited within.
- 5.1.2 In addition to the 100 m wide route options, a search area was defined to illustrate where the connection underground through the AONB and the Menai Strait could be installed. This included five Cable Sealing End Compound (CSEC) search areas, (three on Anglesey, referred to as Anglesey North, Anglesey Central and Anglesey South), and two on Gwynedd, (referred to as Gwynedd North and Gwynedd South). The CSEC search areas encompassed large areas of land either side of the Menai Strait where a CSEC could be sited.
- 5.1.3 These route options and CSEC search areas, as well as the factors influencing the selection of the short-listed route options taken forward, are described in the North Wales Connection Wylfa to Pentir Route Options Report, October 2015 (**Document 9.3**). The report concluded with an overview describing how these might be further refined and appraised in light of further assessment and consultation feedback, and how a single proposed route might then be selected.

Section A: Wylfa to Rhosgoch

- 5.1.4 Following the identification of the main routeing considerations, two route options (1A and 1B) were taken forward for consultation as they offered a broadly parallel route along the eastern side of the existing OHL. These options are illustrated on Image 2.9. These routes had the benefits of:
- maximising the distance from Llanfechell, with its large number of residential properties, socio-economic receptors, listed buildings and conservation area;

- maximising the distance from the Mynydd Mechell Special Landscape Area (SLA),
- avoiding surrounding two Scheduled Monuments; and
- avoiding the need for felling or other woodland management within the ancient woodland, which is relatively rare in the north of Anglesey and where the loss of this type of habitat cannot be fully mitigated.

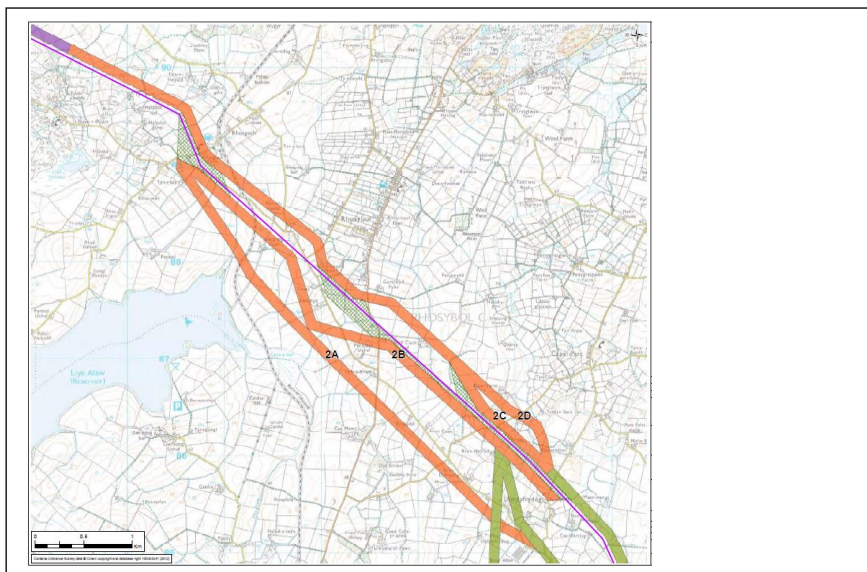
Image 2.9 Route Options 1A and 1B



Section B: Rhosgoch to Llandyfrydog

- 5.1.5 Following the identification of the main routeing considerations, four route options (2A, 2B, 2C and 2D) were taken forward for consultation. These are illustrated on Image 2.10. Route options were identified that would offer a complete overhead alignment that would remain close (and broadly parallel) to the existing line to reduce potential landscape and ecological impacts. There were however individual properties close to the line that necessitated the need to identify deviation options to the east and west of the existing line. These would reduce the risk of the potential oversailing of properties.

Image 2.10 Route Options 2A, 2B, 2C and 2D



Section C: Llandysul to B5110 North of Talwrn

- 5.1.6 Following the identification of the main routing considerations, three route options (3A, 3B and 3C), illustrated on Image 2.11, were taken forward for consultation. Route options were selected that would primarily avoid visual amenity effects on the AONB and areas to the east, the currently unaffected landscape to the west and heritage assets. In selecting route options, both large and small deviation considerations were given to avoid areas of high ecological importance and also to avoid the potential oversailing of properties.

Image 2.11 Route Options 3A, 3B and 3C



Section D: B5110 North of Talwrn to Ceint

- 5.1.7 Following the identification of the main routeing considerations, two route options (4A and 4B), which are illustrated on Image 2.12, were taken forward for consultation. Route options were identified to the east that could avoid potential oversail of properties close to the existing line and options to the west that could avoid residential properties and the Gylched Covert County Wildlife Site (CWS).

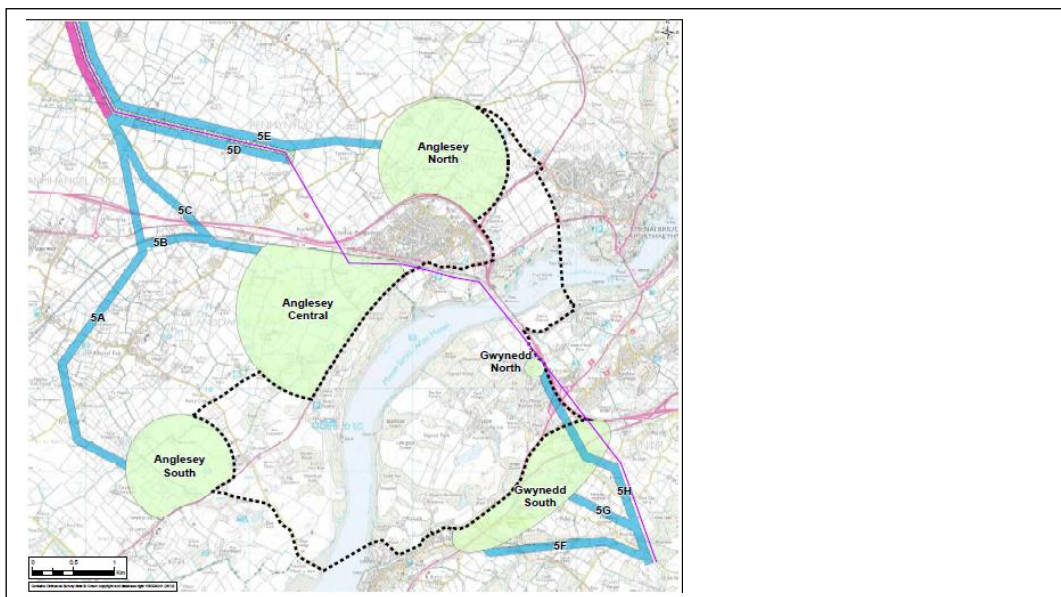
Image 2.12 Route Options 4A and 4B



Section E and F: Ceint to Pentir

- 5.1.8 Eight route options were identified and five search areas for CSECs; three on Anglesey and two on Gwynedd. Five proposed OHL route options (5A–5E) were identified to reach the CSEC search areas on Anglesey and three proposed OHL route options (5F–5H) from the CSEC search areas in Gwynedd to the existing substation at Pentir. These are illustrated on Image 2.13.

Image 2.13 Route Options 5A, 5B, 5C, 5D, 5E, 5F, 5G and 5H and Sealing End Compound Search Areas



5.2 PREFERRED ROUTE OPTION

- 5.2.1 The route options were further refined and appraised in light of further assessment and consultation feedback, and a single proposed route 'the Preferred Route Option' was selected.
- 5.2.2 The preferred route option, as well as the factors influencing the selection is described in the Preferred Route Option Selection Report (**Document 9.4**) and the Menai Crossing Report (**Document 9.6**) and which are summarised below.

Section A: Wylfa to Rhosgoch

- 5.2.3 Option 1A was chosen as the preferred option in Section A as it was located to the east of Llanfechell, with its large number of residential properties, socio-economic receptors, listed buildings and conservation area whilst still keeping close to the existing OHL.
- 5.2.4 Option 1B was not taken forward due to the fact that it sits on higher ground and was further away from the existing line. It therefore did not have the same ability to reduce potential environmental effects as Option 1A.

Section B: Rhosgoch to Llandyfrydog

- 5.2.5 Route Option 2B was identified as the preferred option in this section. This Route Option largely ran parallel and to the south of the existing OHL. However concerns expressed about the landscape and visual effects of a

sharp deviation in the route direction in the central part of this Route Option led to a design enhancement being proposed. This proposal included realigning the existing OHL to the north for a short distance, allowing for close parallel alignment of the lines throughout the whole of this section. The modified Route Option 2B provided good opportunities to synchronise the design of the two lines at the detailed design stage.

- 5.2.6 Route Option 2A was not selected as it would have introduced transmission infrastructure into currently unaffected views and may have posed an increase collision risk to wildfowl present on Llyn Alaw reservoir and Llyn Alaw SSSI to the south.
- 5.2.7 Route Options 2C and 2D would have brought transmission development closer to the villages of Rhosgoch and Rhosybol, and would have resulted in more properties having OHLs to both sides. These route options would also have affected properties located between Llandyfrydog and Capel Parc and on Bryn Goleu Caravan Park in the same location.

Section C: Llandyfrydog to B5110 North of Talwrn

- 5.2.8 Route Option 3C, connecting across to the southern part of Route Option 3B was identified as the preferred combination of options in this section of the route. This Route Option initially ran parallel to the eastern side of the existing line, before switching to the western side in the vicinity of Maenaddwyn. From this point the route option passed a small group of properties to the north of Capel Coch and then followed lower ground to the east of the village, avoiding Cors Erddreiniog Ramsar, SAC, National Nature Reserve (NNR) and SSSI, which is a protected habitat of international importance.
- 5.2.9 The northern section of Route Option 3B was less preferred than Route Option 3C, partly because it would have enclosed the settlement of Llandyfrydog and may have affected the setting of a number of cultural heritage features.
- 5.2.10 Route Option 3A took a wide deviation to the west, away from the existing OHL. However it was considered that this was not sufficiently distant to avoid cumulative effects from both lines (especially where the route option and the existing line diverged and converged), but would nevertheless have introduced transmission infrastructure into areas currently largely unaffected. Concerns about safeguarding operations at RAF Mona had also been raised in respect of this Route Option.

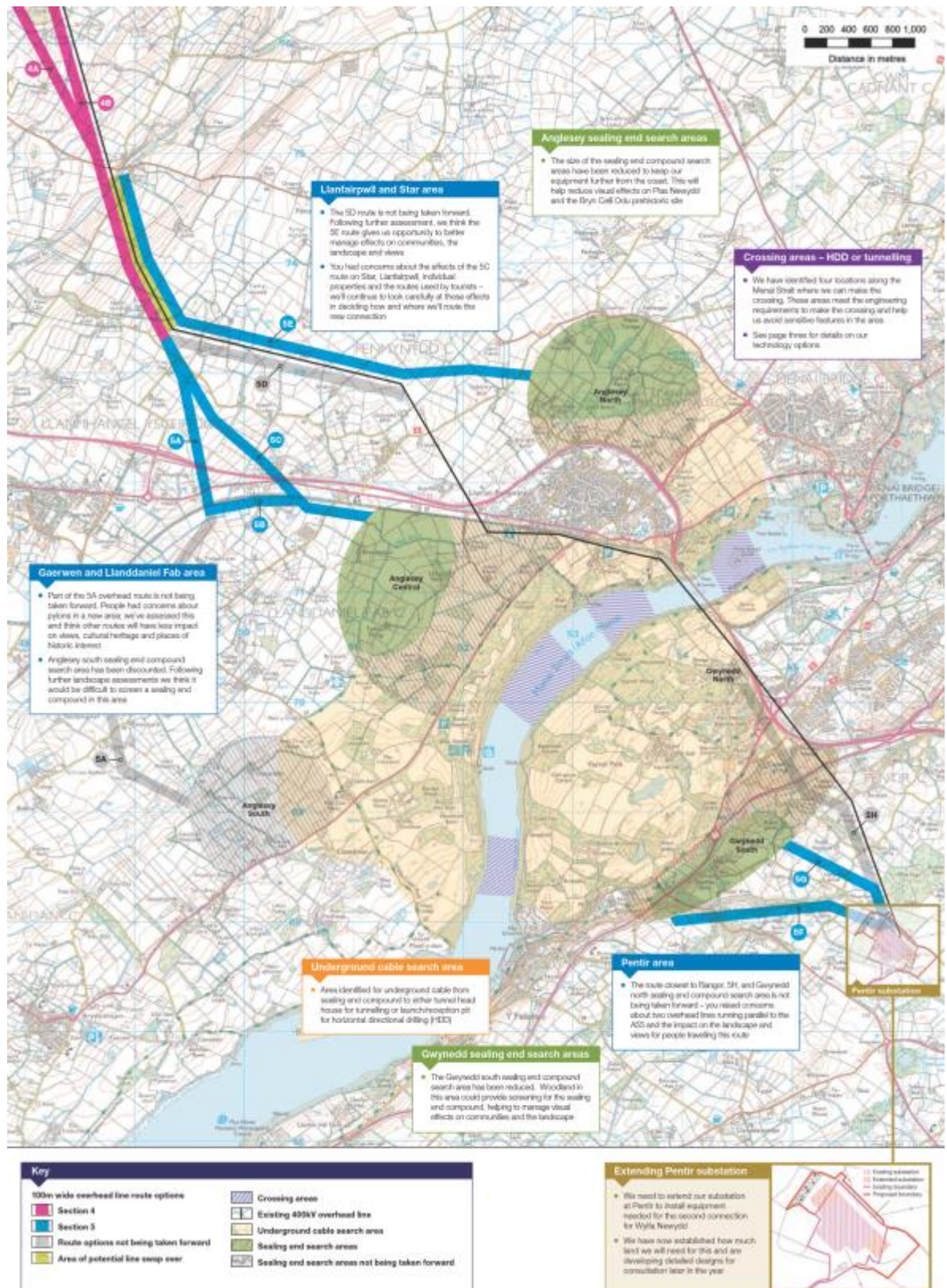
Section D: B5110 North of Talwrn to Ceint

- 5.2.11 Route Option 4B was identified as the preferred option in this section of the route. This route option paralleled the existing line to the west.
- 5.2.12 Whilst this route option would involve the loss of a number of trees along the western edge of Gylched Covert CWS, and would pass close to a small number of isolated properties to the west of the village of Talwrn, it was considered that this route provided a good opportunity to synchronise the design of the two lines at the detailed design stage. This would help to reduce effects making this Route Option more favourable in comparison with alternative Route Option 4A.
- 5.2.13 Route Option 4A would have resulted in more properties being surrounded by the new and existing lines and would have ran close to part of the Anglesey Fens SAC, an internationally important fenland habitat. It would also have introduced angle pylons into an otherwise straight section of the route, widening the landscape and visual effects.

Section E and F: Ceint to Pentir

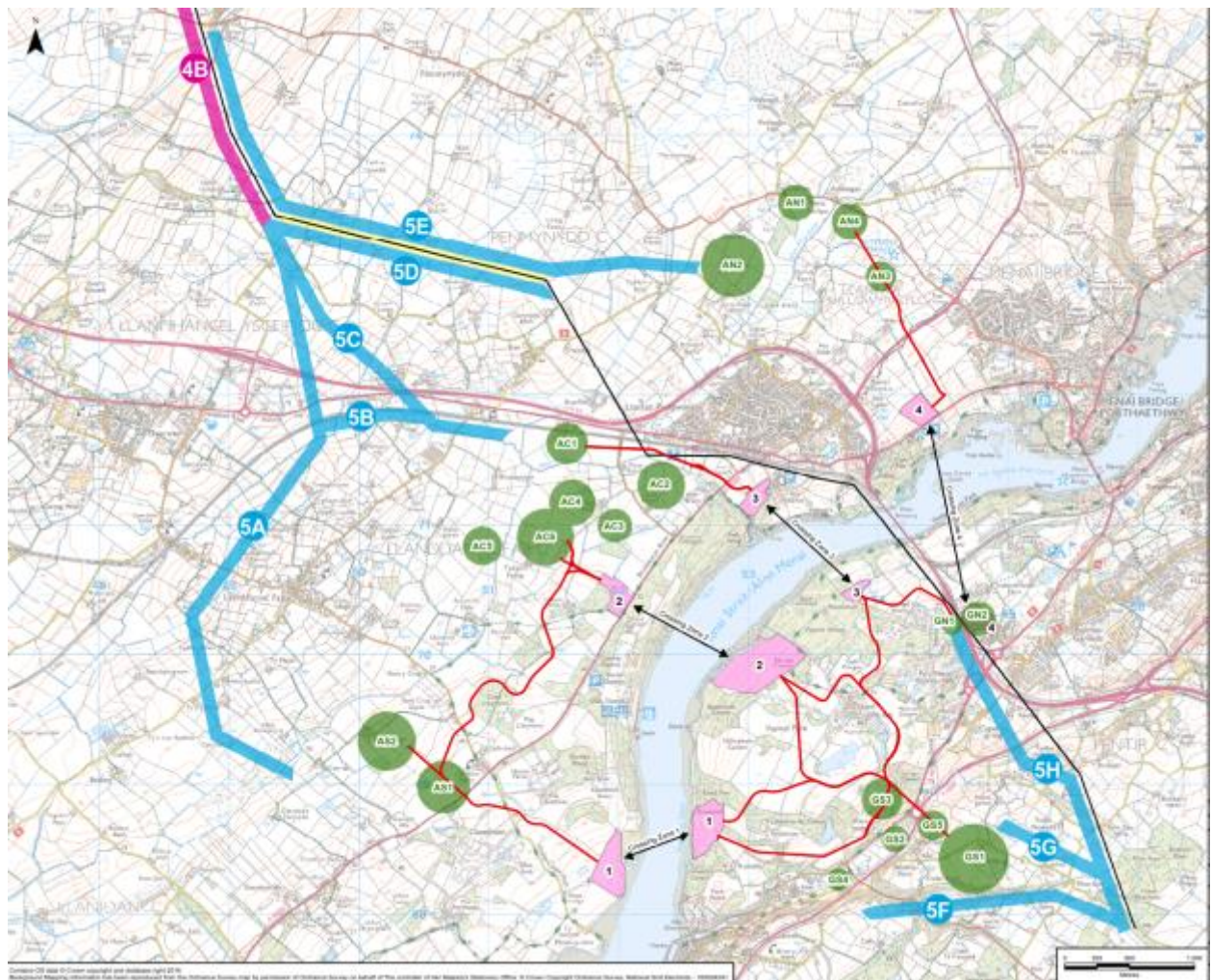
- 5.2.14 Following consultation and further engineering and environmental studies the options under consideration for this section were refined (see Image 2.14 (**Document 9.2**)).

Image 2.14 Refined Route Options and Sealing End Compound Search Areas



- 5.2.15 The Menai Strait Crossing Report (**Document 9.6**) provides information on how the options for Sections E and F were developed and considered for each element (OHL, CSEC, underground cable and the Menai Crossing, See Image 2.15), in order to identify the preferred end to end option for the sections.
- 5.2.16 CSEC siting areas were identified within the CSEC search areas. Five siting areas were identified within the Anglesey North Search Area, all were located north of the A55 and north of Llanfairpwll in a very rural area and within the crescent formed by the B5420. The sites were all in agricultural use.
- 5.2.17 Slower area along the A487 to siting areas on the higher ground towards Pentir Substation.

Image 2.15 OHL Route Corridors, Underground Cable Route Corridors and Menai Crossing Zones



5.2.18 Four potential zones (pink areas on the Image 2.15) were identified for a crossing of the Menai Strait. Potential underground cable route corridors (100 m width) were identified within the 'Underground Cable Route Search Area' to link from the CSEC siting areas to the crossing zones.

5.2.19 Crossing zones were identified based on desk top studies and a high level site visit review. The crossing zones (see Plate 2.1) identified were as follows:

- Crossing Zone 1 – between the Pilot Cottage to the Plas Newydd grounds (National Trust Property) on Anglesey and the slipway off Ffordd Heulyn to the Boat House Dock in the Vaynol Estate;
- Crossing Zone 2 – from the northern boundary of Zone C1 to Pwll Fangol Pier on Anglesey and Coed y Mor on the mainland;

- Crossing Zone 3 – from the northern boundary of Zone C2 to the Britannia Bridge; and
- Crossing Zone 4 – from north from the Britannia Bridge to between Ynys Gored Goch and Ynys Welltog on Anglesey and to Brices Beacon Point on the mainland.

Plate 2.1 Menai Strait Indicative Crossing Zones



5.2.20 A number of techniques were considered for crossing the Menai Strait. These were:

- tunnelling;
 - large bore tunnel (sufficient to house two cable circuits plus additional supporting infrastructure); and
 - small bore tunnel (sufficient to house a single circuit therefore requiring two separate tunnels).
- horizontal directional drill; and

- seabed installation (laid either on or in the seabed).

5.2.21 Options to use existing or proposed infrastructure to carry the cables across the Menai Strait were also considered. These included:

- installation on the Britannia Bridge;
- utilising the redundant pipelines across the Lavan Sands (the Shell pipelines); and
- installing the cables in a new road bridge, the 'Third Menai Crossing'.

5.2.22 The report concluded that the Britannia Bridge was not suitable for cable installation, installation in the existing Shell pipelines would not achieve the required rating and would represent an unacceptable level of risk, requiring construction on the intertidal Lavan Sands which are designated as a SPA and the installation of the cables in a new third road bridge across the Menai Strait was not (at that time) considered feasible within the timescales for the delivery of the connection.

5.2.23 Following a review of individual elements within Sections E and F, a number of end to end options were defined, and as appropriate a back check undertaken of options which were not preferred, to identify whether in combination with other elements these would create a more preferable overall solution. A number of end to end options were identified as follows:

- Option A - OHL (5A (part), 5B or 5C) to AC6 with Underground Cables to Crossing Zone 1 then HDD and Underground Cables to GS1 then OHL (5F or 5G) to Pentir Substation;
- Option B – OHL (5A, 5B or 5C) to AC6 with Underground Cables to Crossing Zone 2 then by Tunnel and Underground Cables to GS1 then OHL (5F or 5G) to Pentir Substation;
- Option C - OHL (5A, 5B or 5C) to AC6 then a Tunnel to GS1 and OHL (5F or 5G) to Pentir Substation;
- Option D - OHL (5A, 5B or 5C) to AC1 with Underground Cables to Crossing Zone 3 then a Tunnel and Underground Cables to GS1 then OHL (5F or 5G) to Pentir Substation;
- Option E - OHL (5A, 5B or 5C) to AC1 with Underground Cables to Crossing Zone 3 then a Tunnel and Underground Cables to GN1 then OHL(5F or 5G) to Pentir Substation;

- Option F - OHL (5D or 5E) to AN with Underground Cables to Crossing Zone 4 then by Tunnel and Underground Cables to GN2 then OHL (5H) to Pentir Substation; and
- Option G - OHL (5D or 5E) to AN then a Tunnel to GS1 and OHL (5H) to Pentir Substation.

5.2.24 Options A, B and D were not preferred due to the considerable technical complexities of routeing underground cables up to GS1. These options would have also had potentially significant effects on areas designated for their landscape and historic characteristics.

5.2.25 Options E and F, although having lower estimated costs than Options C and G (the longer tunnel options) would have had potential visual effects on the setting of both an AONB and a National Park. Although Option F was preferred against technical considerations, both the CSEC siting areas were smaller and more constrained than other options.

5.2.26 Options C and G, did not include any direct buried underground cables therefore would only require 6 no. cables in the tunnel.

5.2.27 Options C and G (the longer tunnel options) reduced the potential for environmental effects against a number of considerations although there was the potential for significant effects. These options, with the tunnel shafts located at greater distance from the Menai Strait, required deeper tunnel shafts, due to topography, within which cable installation would be technically complex.

5.2.28 Option G would have required the deepest shaft and the longest tunnel. On balance, considering the potential environmental effects and technical complexities, the increased cost of a longer tunnel option, and National Grid's statutory duties, Option C was taken forward.

5.2.29 The preferred option was an OHL along route Option 5C to a site in Anglesey Central, a long tunnel to a site in Gwynedd South. The route option in Section E was selected as it would ensure that the proposed OHL would be close to and parallel to the existing OHL at the beginning of the route, allowing maximum opportunities for pylons to be paired. The proposed OHL then takes a different alignment to the Menai Strait area to enable the transition to an underground cable tunnel. Views from Star, Llanfairpwll and individual properties were considered and the proposed OHL was routed further away from Star to reduce visual effects and reduce disturbance during construction and visual effects along the A55.

- 5.2.30 Overall a long tunnel option was generally the preference for all environmental disciplines excluding traffic and transport. It was not preferred for traffic and transport due to the quantities of spoil that would result from the construction of the tunnel and associated shafts. However, this would be a temporary, although potentially significant, rather than a permanent effect.
- 5.2.31 An OHL along route Option 5G was identified as the preferred option from the Gwynedd South THHs and CSEC to Pentir Substation.
- 5.2.32 The Draft Route Alignment Report 2016 (**Document 9.5**) explains the design rationale for the proposed OHL.
- 5.2.33 The Report provided a description of the proposed design for the new OHL within Sections A to D and focussed on the local environmental, socio-economic and technical considerations that helped to shape the draft route alignment proposal that was the subject of statutory consultation under the 2008 Planning Act (Stage 3 Consultation).
- 5.2.34 The Draft Route Alignment Report 2016 (**Document 9.5**) highlighted how the opportunity for the new line to closely parallel the existing OHL for much of the route had played in the design considerations. It also explained how the proposed design sought to synchronise the design of the parallel sections of the new and existing lines, so as to further reduce the potential environmental and socio-economic effects of the connection.
- 5.2.35 The design of the connection within Sections E and F of the Route was described in the Menai Strait Crossing Report (**Document 9.6**). Together these two Reports described the proposed design that was the subject of statutory consultation under the 2008 Planning Act (Stage 3 Consultation).
- 5.2.36 The process of identifying the draft alignment from the preferred route option required a balance between National Grids duties and obligations, consultation feedback, and the need to reduce potential negative effects. National Grid also had to ensure that a technically feasible and safe connection was progressed.

6 Updates Post Stage 3 Consultation

6.1 INTRODUCTION

- 6.1.1 Since Stage 3 Consultation a number of relatively minor amendments have been made to the design consulted on to take account of feedback received, survey and assessment work. These have included minor changes to the location of both the temporary and permanent infrastructure. The Design Report (**Document 7.17**) details these changes and the following sections provide a summary. The Consultation Report (**Document 6.1**) sets out how these changes have been communicated following consultation and where appropriate further consulted upon.
- 6.1.2 Within this section, proposed specific locations for pylons are referenced for the purpose of illustrating how design changes have been incorporated to reduce potential effects. It should be noted however that the proposed alignment of the OHL would be subject to Limits of Deviation (LOD) to allow a necessary and proportionate degree of flexibility. LOD is further described in Chapter 6 EIA Methodology and Basis of Assessment (**Document 5.6**).
- 6.1.3 The amendments made have resulted in the design of the Proposed Development that is now subject to an application for a DCO under Section 37 of the Planning Act 2008 as described in Chapter 3 Description of the Proposed Development (**Document 5.3**) and Chapter 4 Construction, Operation, Maintenance and Decommissioning of the Proposed Development (**Document 5.4**).

General Construction Design

- 6.1.4 These amendments have been made to ensure the construction design would be safe and as efficient as possible from a technical/engineering perspective and reduce as far as possible the potential for adverse effects on the environment.
- 6.1.5 Where proposed pylon locations have been amended, this would subsequently have an impact on the location of the associated pylon working areas and pulling positions.

6.1.6 General amendments made to the construction design of the Proposed Development are as follows:

- in several places, in response to ongoing discussions with affected Persons with an Interest in Land (PILs), construction aspects (e.g. working areas, pulling positions, scaffold positions, etc) have been revised with the intention to reduce impacts upon agricultural operations wherever possible;
- Construction components (e.g. pulling positions, scaffold positions, etc.) and working areas would be away from difficult topography and more sensitive landform wherever possible;
- existing agricultural accesses and gaps in hedgerows have been utilised wherever possible, thereby reducing the requirement for additional new access points; and
- the Order Limits and working areas have been reduced as far as possible to take into account the above and to reduce the land required to construct, operate, and maintain the Proposed Development.

Section A: Wylfa to Rhosgoch

Wylfa Substation Design

- 6.1.7 Finalisation of engineering requirements confirmed that the extension on the southern boundary of Wylfa Substation to accommodate new electrical equipment would not be required; only the local realignment of the existing compound fence line to accommodate the proposed works.

Permanent Infrastructure

- 6.1.8 A section of the proposed 4ZA OHL between proposed pylons 4ZA005 and 4ZA014 has been amended. Following discussion with the PIL, National Grid has now voluntarily acquired a property and as a result the Proposed Development would now route over the property and would remove the residential use of the property, Cae Adda Fach. The amendment would result in the OHL being as far south as possible from the properties at Ty Newydd, Bryngwyn, and Gors. This amendment has allowed the alignment to be straightened; avoiding the requirement for the alignment to 'kick out' to the north at 4ZA008 to go around the property; removing the requirement for tension pylons in this location and would also result in one fewer pylon as previously proposed pylon 4ZA011 would no longer be required. . This has resulted in reduced impacts in terms of proximity to other properties in the area and the requirement for one less pylon to be introduced into the landscape.

- 6.1.9 Proposed pylon 4ZA019 has also been moved further east to ensure it would be closer to the field boundary. This would enable easier use and management of the land when the Proposed Development is operational, reducing potential disturbance upon the agricultural business.

Construction Design

- 6.1.10 A number of amendments to the proposed bellmouths locations have been made including:

- bellmouths A1 and A2 have been moved to the south to utilise an existing accesses removing the need to construct two new access points;
- bellmouth A4 has been relocated to the north-west to ensure sufficient space to construct scaffold protection for the road crossing of the proposed section of 4ZA OHL;
- an alternative to bellmouth 5, has been identified (bellmouth A5a) to address concerns raised regarding road safety. Only one of the bellmouth locations would be utilised should the DCO be granted; and
- bellmouths A6 and A7 have been relocated to ensure sufficient scaffold protection could be provided for the road crossing of the proposed 4ZA OHL and the existing 4AP OHL following the Cae Adda Fach alignment change.

- 6.1.11 Proposed access tracks have been amended in line with permanent design changes and changes to bellmouths. Access tracks have been realigned to accommodate request from PILs to reduce potential disruption to land and to cross hedgerows at an angle as close to 90 degrees as practice, reducing the scale of potential removal. In Section A other access track amendments include, but are not limited to:

- access between 4AP002 to 4AP004 and 4ZA005 to 4ZA006 has been realigned to use an existing SP Manweb access point;
- access at 4AP006 has been amended to relocate the track to use an existing crossing over a Water Framework Directive (WFD) watercourse removing the need to install a new bridge over this watercourse;
- access between 4AP010 and 4AP011 has been to avoid an area of Tree Preservation Order (TPO) trees and a pond in this area. The amended route would also avoid using a bridge considered potentially unsuitable for HGV movements;

- access between 4AP016 and 4AP017 has been realigned to be further to the south to avoid steep wet ground and to approach a new bridge at a better angle;
- access between 4ZA014 and 4ZA015 has been amended to avoid the Llanfechell Waste Water Treatment Works and to avoid impacting on a pond;
- access between 4ZA021 and 4ZA023 has been realigned between 4ZA021 and 4ZA022 to make use of an existing gate, removing the requirement for an additional access point in this area. The amended alignment would avoid the potential encroachment into a better quality field to the north. The access track between 4ZA022 and 4ZA023 has been realigned to avoid impacting on an area of rocky outcrops and would also avoid impacting on an additional field to the south; and
- access between 4ZA023 and 4ZA025 has been amended to reduce the potential impact on hedgerows and to move it further away from a GCN pond.

6.1.12 Access Tracks for third party works have also been amended. Amendments include:

- repositioning of and the addition of tracks to areas of works;
- removal of tracks no longer required; and
- amendments to track so avoid effects on trees and hedgerows.

Section B: Rhosgoch to Llandyfrydog

Permanent Infrastructure

6.1.13 A section of the proposed 4ZA OHL between proposed pylons 4ZA025 and 4ZA028 has been amended. An option to secure the purchase of Bryn Alaw has been agreed. This would allow the OHL to oversail the property, increasing the distance between the new OHL and other properties in Rhosgoch; removing the route divergence in this area and; increasing design synchronisation with the existing and proposed new OHL section to the south. Proposed pylon 4AP024 and 4ZA028 have been amended to a design which would be shorter in height and slimmer at the base than the previously proposed pylon; the change in pylon type is considered to be of benefit in this visually prominent location.

6.1.14 Proposed pylon 4AP030 has moved to the north-west to ensure it would be closer to the field boundary and would now be synchronised with pylon

4ZA034; this would ensure that more of the field would be available during the operation of the Proposed Development. As a result of the movement of 4AP030, associated amendments to pylon locations have been made to proposed pylons 4AP029, 4AP032, 4AP033, 4AP034 and 4AP035.

- 6.1.15 Proposed pylon 4AP031 has been repositioned to the east to ensure it would be closer to the corner of the field boundary; this would ensure more of the field is available during the operation of the Proposed Development.
- 6.1.16 Proposed pylon 4AP036 has moved to the south-east to ensure it would be closer to the field boundary and would be located closer to the field boundary to ensure that it would be synchronised with pylon 4ZA040 immediately south-east of Bryn Goleu Caravan Park. This would ensure that the design would be more compliant with Holford Rule 6 and its accompanying note.
- 6.1.17 The realignment between proposed pylons 4AP028 and 4AP037 has resulted in a closer paralleling of the existing section of 4ZA OHL. The separation distance between the two OHLs would be reduced.

Construction Design

- 6.1.18 A number of amendments to the proposed bellmouths locations have been made including:
- the number of bellmouths proposed in this section has reduced from 17 to 11, due to the removal of bellmouth B3, B7, B8, B8a, B10, B13 and B13a;
 - bellmouth B5 has moved to the north-west to improve road visibility;
 - bellmouth B6 has been replaced by bellmouth B7 located further away from residential properties to the south; and
 - bellmouth B12 (now reference B10) has been moved to the west and amended to become a cross over bellmouth with proposed bellmouth B11 to provide access both north and south of the minor road. Access tracks have been amended in line with permanent design changes and changes to bellmouths.
- 6.1.19 Proposed access tracks have been realigned to accommodate request from PILs to reduce potential disruption to land and to cross hedgerows at an angle as close to 90 degrees as practicable, reducing the scale of potential removal. In Section B other access track amendments include, but are not limited to:

- access through Gaer Farm (north-east of 4ZA037) has been removed as access to proposed pylon 4AP033 could be achieved from bellmouth B9. The removal of this access track would move construction traffic away from the residential property, reducing potential disturbance for this receptor;
- access at 4AP034 has been realigned to facilitate a straighter route to proposed pylon 4AP034. A length of access track has been removed which would result in construction traffic being routed further away from Boston Cottages;
- access between 4AP035 and 4AP036 has been amended due to the change in pylon positioning and to utilise existing gaps in hedgerows to reduce the potential for loss;
- access track between bellmouth B13 and 4ZA042 has been realigned slightly to ensure that it would be perpendicular to a WFD watercourse, facilitating the construction of a clear-span bridge; and
- access between 4ZA042 and 4ZA043 (in Section C) has been realigned to the north-east of pylon 4ZA042, continuing east along a field boundary before turning south to pylon 4ZA043. The amendment in this location would avoid potential impacts on an important hedgerow.

6.1.20 Access Tracks for third party works have also been amended. Amendments include:

- repositioning of and the addition of tracks to areas of works;
- removal of tracks no longer required;
- realignment of tracks to reduce disturbance of land; and
- amendments to avoid effects on hedgerows.

Section C: Llandyfydog to B5110 North of Talwrn

Permanent Infrastructure

6.1.21 The proposed pylon 4ZA045 has been moved to the north-west to ensure the efficient operation of farm machinery following construction. This would result in less agricultural disturbance during operation of the Proposed Development.

6.1.22 The relocation of proposed pylon 4ZA045 has resulted in adjacent proposed pylons 4ZA043, 4ZA044, and 4ZA046 being slightly repositioned to retain

appropriate span lengths along this section of the proposed 4ZA OHL and in consideration of Holford Rule 3 where a preference for straight lines is stated where possible.

- 6.1.23 The proposed 4AP OHL between proposed pylons 4AP041 and 4AP048 was amended to move proposed pylon 4AP043 further away to the north from a residential property. In order to maintain the crossing point across the road and avoid bringing the conductors any closer to the properties in span 4AP045 – 4AP046, proposed pylon 4AP046 was required to move slightly to the south-west.
- 6.1.24 As a result of this amendment, proposed pylons 4AP042, 4AP044, 4AP045 and 4AP047 were required to be moved so that they alignment would stay within the design specifications for the maximum span between adjacent pylons. The separation distance between the two OHLs would be reduced.
- 6.1.25 The realignment of this section of the proposed 4AP OHL would:
- take the proposed angle pylon 4AP043 further away from the property at Parc yr Ynys;
 - enable the amendment of the design of pylon 4AP043 to a pylon shorter in height and slimmer at the base than previously proposed; and
 - move proposed pylon 4AP045 slightly to the north, further away from an existing pond.
- 6.1.26 Proposed pylon 4AP044 has been moved marginally to the south to reduce the potential impact on agricultural operations.
- 6.1.27 Proposed pylon 4AP050 has been moved to the south to ensure it would be closer to the field boundary. This would result in less agricultural disturbance and maximum ongoing use of the land during operation of the Proposed Development.
- 6.1.28 Proposed Pylon 4AP055 has been moved to the north-west to the edge of the field boundary (and the edge of the marshy grassland habitat). Resulting in adjacent proposed pylons 4AP053 and 4AP054 also being repositioned along the alignment to the north-west to retain appropriate span lengths along this section of the proposed 4AP OHL.
- 6.1.29 Proposed pylon 4AP056 have been amended to a design which would be shorter in height and slimmer at the base than the previously proposed

pylon; the change in pylon type is considered to be of benefit in this visually prominent location.

- 6.1.30 Proposed pylon 4AP062 has been moved to the north to ensure it would be located outside of the more sensitive habitat, reducing potential ecological impacts. Previously the pylon was positioned in marshy grassland habitat; it is now proposed in neutral semi-improved grassland. This amendment has resulted in the 'unpairing' of proposed pylon 4AP062 and existing pylon 4ZA064.

Construction Design

- 6.1.31 Bellmouth C3 has been moved to create a cross over bellmouth with proposed bellmouth C4. This amendment would have less potential for disturbance on nearby residential receptors as it would avoid using a stretch of public highway. Bellmouth C4 has also moved to the south to avoid direct impacts to the important hedgerow.
- 6.1.32 Bellmouth C5 has moved to the north to reduce potential impacts on farmland. The new access track associated with proposed bellmouth C5 would utilise an existing track and remove the requirement for a bridge.
- 6.1.33 Bellmouth C8 has been repositioned in an adjacent field to the north to create a cross over bellmouth with an access to a proposed scaffold location over the road. This change would ensure that both accesses would utilise existing gateways.
- 6.1.34 Bellmouth C10 and its associated access tracks have been moved into an adjacent field to provide improved visibility, avoid being located directly beneath a proposed scaffold position and to avoid a gas pipeline. The movement of this proposed bellmouth and associated access track would largely avoid routeing through an area of habitat linked to the nearby SAC, although the habitat itself is not designated as a SAC habitat. Bellmouth C11 is no longer required.
- 6.1.35 Proposed access tracks have been amended in line with permanent design changes and changes to bellmouths. Access tracks have been realigned to accommodate request from PILs to reduce potential disruption to land and to cross hedgerows at an angle as close to 90 degrees as practice, reducing the scale of potential removal. In Section C other access track amendments include, but are not limited to:
- access between 4AP040 and 4AP041 has been realigned in multiple places to cross hedgerows in a way in order to reduce potential loss.

The access has also been realigned to better facilitate a bridge crossing over a WFD watercourse;

- access from 4AP043 to 4AP045 has been realigned to utilise an existing gate and reduce potential impacts on hedgerows. The previous access to the east of pylon 4AP044 has been removed following the relocation of Bellmouth C3 to the south. The movement of this Bellmouth and subsequent removal of access track would reduce impacts on a farm during construction and would also reduce the number of construction vehicles using the public roads in this area, reducing potential disturbance on residential properties in the area;
- access between 4AP045 and 4AP046 has been realigned to the south to be as close to the pond as possible to reduce potential disruption to land;
- access from 4AP052 to 4AP055 has been realigned to the south of the pylon working areas to reduce the impact on land during construction;
- access between 4AP055 and 4AP056 has been realigned to the south in this area to avoid an ecologically sensitive habitat, reducing the potential for environmental effects in this location;
- access between 4AP061 and 4AP062 has been amended to reduce potential impacts on an Important Hedgerow and to remove it from an important habitat, reducing the potential for environmental impacts in the area; and
- access from 4AP062 to 4AP063 (in Section D) has been realigned to the south-west from 4AP062 to utilise an existing gap in the field boundary. The access continues to the south along the field boundary to join into the working area at pylon 4AP063.

6.1.36 Access Tracks for third party works have also been amended. Amendments include:

- the addition of tracks to areas of works; and
- removal of tracks no longer required.

Section D: B5110 North of Talwrn to Ceint

Permanent Infrastructure

6.1.37 Two route options are proposed for the Proposed Development, in the vicinity of the residential property of Dolydd Newydd close to the B5109 and west of Talwrn. The two potential route options would be as follows:

- Option A is based on an agreement being entered into with the current owners to facilitate an easement and associated arrangement in respect of the dwelling. The residential property of Dolydd Newydd would be oversailed by the proposed section of 4AP OHL. The proposed section of OHL would retain a parallel alignment with the existing section of 4ZA OHL ; and
- Option B would follow the same principles as the Stage 3 Consultation design with the proposed section of 4AP OHL deviating slightly further away from the existing section of 4ZA OHL to ensure it would be routed around the residential property of Dolydd Newydd, rather than oversailing the property. This option would increase the separation distance between the two OHLs and would result in the property of Dolydd Newydd being located between the two OHLs.

6.1.38 Only one of the options would be implemented in the event that the DCO is granted.

Option A

6.1.39 A section of the proposed 4AP OHL between proposed pylons 4AP064 and 4AP067 has been amended to enable an option to be presented as part of the DCO application for should agreement to facilitate an easement and associated arrangement in respect of the dwelling be gained. This would allow the route of the proposed 4AP OHL to oversail the residential property and keep the OHLs in close parallel.

6.1.40 To enable Option A to be achieved, the following amendments have been made to the Proposed Development:

- proposed pylon 4AP064 has moved to the south to ensure it would be synchronised with existing pylon 4ZA066;
- proposed pylon 4AP065 has been removed;
- proposed pylon 4AP066 has moved to the north east; and
- proposed pylon 4AP066 has been amended to a tension pylon (previously a suspension pylon).

Option B

- 6.1.41 Proposed pylon 4AP064 has been moved to the north-west along the alignment of the proposed 4AP OHL into the adjacent field. The repositioning of the pylon would ensure it would be outside of direct views from the property at Ty Mawr, reducing the potential effects on this property, however it would also result in the 'unpairing' of proposed pylon 4AP064 and existing pylon 4ZA066. The localised, reduced visual effects for the property at Ty Mawr is considered to be of greater overall benefit than the lack of synchronisation of the 4AP OHL in views from the wider landscape.
- 6.1.42 Pylon 4AP065 has moved to the north-west to the rear of the barn in the adjacent field. The repositioning of the pylon would result in the conductors oversailing the garden at the property of Madryn, however, the likely effects on views to the east from the property would be reduced. The repositioned pylon would be closer to the field boundary; this would increase the amount of productive land available and would enable easier use and management of the land during operation of the Proposed Development.

Construction Design (Applicable to Option A and B)

- 6.1.43 A number of amendments to the proposed bellmouths locations have been made including:
- the number of bellmouths has reduced from six to four (removal of D4 and D6);
 - bellmouths D1 and D2 have been moved to the east to keep the associated access tracks within fields already directly affected by the Proposed Development; and
 - proposed bellmouth D3 has been moved to the south-east to ensure only one of two existing access gates would be required to be used for access. This amendment would also avoid impacts on an Important Hedgerow.
- 6.1.44 Proposed access tracks have been amended in line with permanent design changes and changes to bellmouths. Access tracks have been realigned to accommodate request from PILs to reduce potential disruption to land and to cross hedgerows at an angle as close to 90 degrees as practice, reducing the scale of potential removal. In Section D other access track amendments include, but are not limited to:
- access from proposed pylon 4AP062 (in Section C) to 4AP063 has been realigned to the south-west from 4AP062 to utilise an existing

gap in the field boundary. The access continues to the south along the field boundary to join into the working area at pylon 4AP063;

- access between proposed pylons 4AP063 and 4AP064 has been realigned slightly to the west to avoid a steep bank and to remove the track from a field that would otherwise be unaffected by the Proposed Development (except for oversailing) during operation. This realignment would also facilitate the use of an existing track;
- access between proposed pylon 4AP064 and bellmouth D1 has been realigned to reflect amended pylon positions in this location and to utilise an existing gap in a hedgerow and avoid a parcel of land to the east of bellmouth D1;
- access from bellmouth D2 to proposed pylon 4AP070 has been realigned to the east to avoid an archaeological enclosure located to the north-west of 4AP067. North of proposed pylon 4AP068, this access track has been amended to deviate to the east in order to avoid impacting on a nearby spring and to move it further away from the Gylched Covert County Wildlife Site (CWS); and
- access from bellmouth D4 to bellmouth E2 (in Section E) has been realigned to avoid a road considered unsuitable for HGVs.

6.1.45 Access Tracks for third party works have also been amended. Amendments include utilising existing track, the repositioning of a track.

6.1.46 Penmynydd road construction compound has been refined to remove the western field previously proposed, leaving only the eastern field to accommodate the proposed construction compound for the DCO application. The eastern field was selected as the construction compound would:

- be further away from the property at Ty'n y Felin;
- avoid the potential for additional effects on an important hedgerow forming the north-western and south-eastern boundaries of the western field; and
- it is flatter and more suitable for construction.
- Section E: Ceint to the Afon Braint

Permanent Infrastructure

- 6.1.47 Proposed pylon 4AP076 has been moved to the south to ensure it would be closer to the field boundary. This would result in less agricultural disturbance and maximum ongoing use of the land during operation of the Proposed Development. The amendment would also enable greater synchronisation with the adjacent existing pylon 4ZA077.
- 6.1.48 The proposed 4AP OHL between proposed pylons 4AP078 and 4AP082 has been amended to reduce visual effects on the properties at Fron Deg, Tyn Cae, and Paradwys. The OHL is further away from the properties to the north and reduces the angle of proposed pylon 4AP082 reducing visual effects to the properties at Fron Deg and Tyn Cae.
- 6.1.49 Pylon 4AP078 has been amended to a standard suspension pylon and the proposed 4AP OHL now continues its previous alignment for one more span to the next proposed pylon 4AP079, which has been repositioned to the south-west and changes from a standard suspension pylon to a tension pylon.
- 6.1.50 The proposed tension pylon at 4AP083 has been amended to a less bulky D25 pylon type to reduce which would be considered to be of benefit in this visually prominent location.
- 6.1.51 Proposed pylons 4AP085 and 4AP086 have changed from the standard lattice pylon to low height lattice pylon. The proposed 4AP OHL has been amended at this section to reduce the visual effects on the village of Star to the north and views towards Snowdonia and the Llyn Peninsula. To accommodate the change to low height pylons, proposed pylon 4AP084 would be required to be amended to a tension pylon.

Construction Design

- 6.1.52 A number of amendments to the proposed bellmouths locations have been made including:
- proposed bellmouth E1 has been amended to a crossover bellmouth with proposed new bellmouth E2 to the north;
 - Previously proposed bellmouth E2 has been removed and a new proposed bellmouth E2 added to form a crossover bellmouth with proposed bellmouth E1.
 - bellmouths E3 and E4 have been moved to the south-east to reduce potential impacts on land; ;

- a new proposed bellmouth E5a would be proposed to enable construction vehicles to access the Proposed Development working areas north of the A55. This amendment would alleviate construction traffic at proposed bellmouth B5 (previously referenced B7) as it would allow working areas to be accessed from two areas as opposed to one;
- bellmouth E7 has been repositioned to the north-west, creating a revised bellmouth (now called bellmouth E5). The repositioned bellmouth, and its associated access tracks would reduce the amount of temporary works and potential vegetation loss and reduce the number of hedgerow crossings required; and
- bellmouth E9 (now called bellmouth E7) has been moved to the north to avoid a horse grave and a paddock.

6.1.53 Proposed access tracks have been amended in line with permanent design changes and changes to bellmouths. Access tracks have been realigned to accommodate request from PILs to reduce potential disruption to land and to cross hedgerows at an angle as close to 90 degrees as practice, reducing the scale of potential removal. In Section E other access track amendments include, but are not limited to:

- access between 4AP074 and 4AP075 has been realigned to the east to run alongside field boundaries before continuing south to pylon 4AP075;
- access between 4AP077 and 4AP078 have been realigned to the east. The amendments to the bellmouths and access tracks in this location has also removed the requirement for previous Bellmouths B5 and B6, reducing the number of accesses connecting to the local highway network in this area.
- access track associated with new Bellmouth E5a has been added;
- access from 4AP079 to 4AP082 has been realigned to the south in order to follow the field boundary;
- access from Bellmouth E7 (previously E9) has been realigned; and
- access between 4AP086 and 4AP087 (in Section F) has had a bridge crossing added to facilitate the crossing of a WFD watercourse.

6.1.54 Access Tracks for third party works have also been removed and amended. Amendments include the addition of a length of track and the realignment of another track to avoid the crossing of field boundaries.

Section F: Afon Braint to Pentir

Permanent Infrastructure

- 6.1.55 Proposed pylon 4AP087 has changed from a standard height lattice pylon to a low height lattice pylon. The alignment of the proposed 4AP OHL has been amended to reduce the potential visual effects on the village of Star to the north and views towards Snowdonia and the Llyn Peninsula.
- 6.1.56 The alignment of the proposed OHL between the proposed Tŷ Fodol THH/CSEC has been amended to reduce the visual impact of the connection into Pentir Substation. Proposed pylons 4AP088 and 4AP089 have been repositioned to the south; proposed pylon 4AP090 has been repositioned to the north; this ensures the alignment of the proposed 4AP OHL remains as straight as possible.
- 6.1.57 The realigned 4AP OHL would be closer to the wooded valley to the south and would bring the OHL further away from the residential properties to the north, namely Fodol and Hafodol Uchaf. The realignment would also reposition proposed pylon 4AP090 further away from Garth Farm to the south and alter the pylon design from a bulkier tension pylon to a suspension pylon.
- 6.1.58 Proposed pylon 4AP088 has been changed from a standard height lattice pylon to a low height lattice pylon. The proposed 4AP OHL has been amended at this section to reduce the effects on views, particularly from the north. The remaining OHL to Pentir have closer public viewpoints (crossing Fodolydd Lane) and additional nearby residential properties. Therefore, the use of low height pylons in those locations, with more conductors at a lower height in a horizontal formation, could result in increased effects in near-distance views.

Tunnel Head Houses and Cable Sealing Ends

- 6.1.59 The design of the Braint and Tŷ Fodol THH/CSECs have been developed from an engineering perspective; consideration has also been given to layout, levels, building form and design, landscaping and access. This has been considered alongside consultation responses.
- 6.1.60 The proposed maximum height of the Braint THH/CSEC has been substantially reduced as site ventilation fans are no longer proposed at Braint. This design change would help to better accommodate the building in the rural landscape, and increase the effectiveness of screening.
- 6.1.61 In order to better accommodate the Tŷ Fodol THH/CSEC in the local landscape and help to reduce wider visual effects, the indicative design now

proposed includes the creation of reduced development site levels, stepping finished levels from the surrounding ground to the CSEC, and again to the site level for the THH compound. By cutting into the existing slope in this way the apparent height of external equipment and the THH (above ordnance datum) would be reduced, and the extent and magnitude of effects upon views reduced.

Tunnel

6.1.62 No amendments have been made following Stage 3 Consultation.

Pentir Substation

6.1.63 The extent of the north-western extension to the substation has been reduced due to an alternative solution that provides system security without the requirement to add an additional bus section and relocate one of the existing transmission circuits to this new section to the north-west of the existing substation. The smaller extension required to the north-west fits within the land plot more efficiently, removing the need to alter the direction of the busbars which lengthened the extension required. The reduced length of the extension would result in reduced construction effects and release additional areas for the implementation of peripheral screen planting.

Construction Design

6.1.64 The location and size of the Pentir OHL Construction Compound has remained the same, however the Substation Compound (previously proposed to the east of Pentir Substation) has been relocated within the OHL Compound to the south. This amendment would have the benefit of no longer using the area to the east of Pentir Substation for the Substation Compound, allowing it to be used as additional space for bunding and landscaping early in the construction phase, allowing planting to become established and reducing potential environmental effects.

6.1.65 A number of amendments to the proposed bellmouths locations have been made including:

- bellmouth F1 would be relocated north-west to improve visibility;
- a new proposed bellmouth (F1C) would be proposed north of bellmouth F1. This bellmouth would alleviate pressure at proposed bellmouth F1 and ensure construction vehicles would be able to access the operational compound from the A5 and A55 to the north and the A4080 to the south; and

- previous Bellmouth F12, F13 and F15 would no longer be required. The removal bellmouth F13 and its associated access track would reduce the level of disturbance during construction and reduce the amount of habitat affected by works.

6.1.66 Proposed access tracks have been amended in line with permanent design changes and changes to bellmouths. Access tracks have been realigned to accommodate request from PILs to reduce potential disruption to land and to cross hedgerows at an angle as close to 90 degrees as practice, reducing the scale of potential removal. In Section F other access track amendments include, but are not limited to:

- access associated with bellmouth F1C has been included in the Proposed Development design to connect into the Braint THH/CSEC which would have the substantial benefit of removing the requirement for construction traffic to be routed past the properties at Pont Ronwy. This access track has also been aligned to avoid a wooded area north-west of Llwyn-Ogan.
- access from Bellmouth F2 to Braint THH/CSEC has been realigned slightly to the north-east to avoid potential impacts on a Category A tree in the area; and
- access between 4AP090 and Pentir Substation has been amended to remove the track from a field to the south and realign to follow the route of an existing track through an area of woodland.

6.1.67 Access Tracks for third party works have also been removed and amended. Amendments include the addition of lengths of track and the removal of a section of track from a ravine, the removal of these works would avoid potential impacts associated with trenching through a watercourse and woodland.

6.2 PROPOSED DEVELOPMENT

6.2.1 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. The Proposed Development is illustrated on the Works Plans (**Document 4.4**).

6.2.2 Chapter 4, Construction, Operation, Maintenance and Decommissioning of the Proposed Development (**Document 5.4**) describes how the Proposed Development would be constructed, operated, maintained and decommissioned. Construction elements are illustrated on the Design Plans (**Document 4.13**).

7 Back-Check

7.1 INTRODUCTION

7.1.1 Throughout the design and consultation process National Grid has committed to back-check the decisions taken at earlier stages. With the support of environmental and technical advisers, National Grid has considered whether policy changes, additional information and the detailed assessment of likely significant effects from the final design proposal would alter earlier design decisions. The Back-check of Wylfa-Pentir Design Decisions (**Document 7.18**) summarises the main conclusions from that review, and supports the application for the DCO.

7.1.2 The Back-check of Wylfa-Pentir Design Decisions (**Document 7.18**) provides an overview of potentially material changes since previous design decisions were taken. These changes fall under five main areas:

- the nature and location of existing and new contracted connections to the electricity transmission system in North Wales;
- consultation feedback;
- planning policy, statute and planning precedent;
- the availability of more detailed baseline and design information (from environmental, socio-economic and geological surveys and the emerging assessment findings based on the final DCO design and proposed mitigation measures) and;
- National Grid acquisition of land and significant developments by third parties.

7.1.3 The report reviews the previous design decisions (back-check) in light of the changes detailed above. This review and back-check has helped National Grid to confirm that the design for which a DCO is now sought is the most appropriate means of addressing the project need case, having regard to consultation feedback, planning policy and National Grid's statutory duties.

References

Ref 2.1 Overarching National Policy Statement (NPS) for Energy (EN-1) Department for Energy and Climate Change (DECC), 2011

Ref 2.2 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009. Available at:
<http://www.legislation.gov.uk/uksi/2009/2263/contents/made>

Ref 2.3 The Planning Act 2008. Available at:
http://infrastructure.independent.gov.uk/wp-content/uploads/2009/08/ukpga_20080029_en.pdf

Ref 2.4 Electricity Act 1989. Available at:
<http://www.legislation.gov.uk/ukpga/1989/29/contents>

Ref 2.5 National Grid's Stakeholder, Community and Amenity Policy
http://www.nationalgrid.com/NR/rdonlyres/21448661-909B-428D-86F0-2C4B9554C30E/39991/SCADocument6_2_Final_24_2_10.pdf

Ref 2.6 Our approach to the design and routeing of new electricity transmission lines: <http://www2.nationalgrid.com/UK/In-your-area/Community-Engagement/>

Ref 2.7 Our approach to Options Appraisal:
<http://www2.nationalgrid.com/UK/In-your-area/Community-Engagement/>

Ref 2.8 Summary of Important Project Changes and Updates, January 2015
http://nationalgrid.opendebate.co.uk/files/nationalgrid/North_Wales/North_Wales_Connection_Project_Summary_of_Updates_January_2015.pdf

Ref 2.9 <https://www.nationalgrid.com/uk/electricity/codes>

Ref 2.10 The Holford Rules set design principles for routeing OHLs. A copy of the Holford Rules can be found at the following link:
http://nationalgrid.opendebate.co.uk/files/nationalgrid/North_Wales/Holford_Rules6.pdf

