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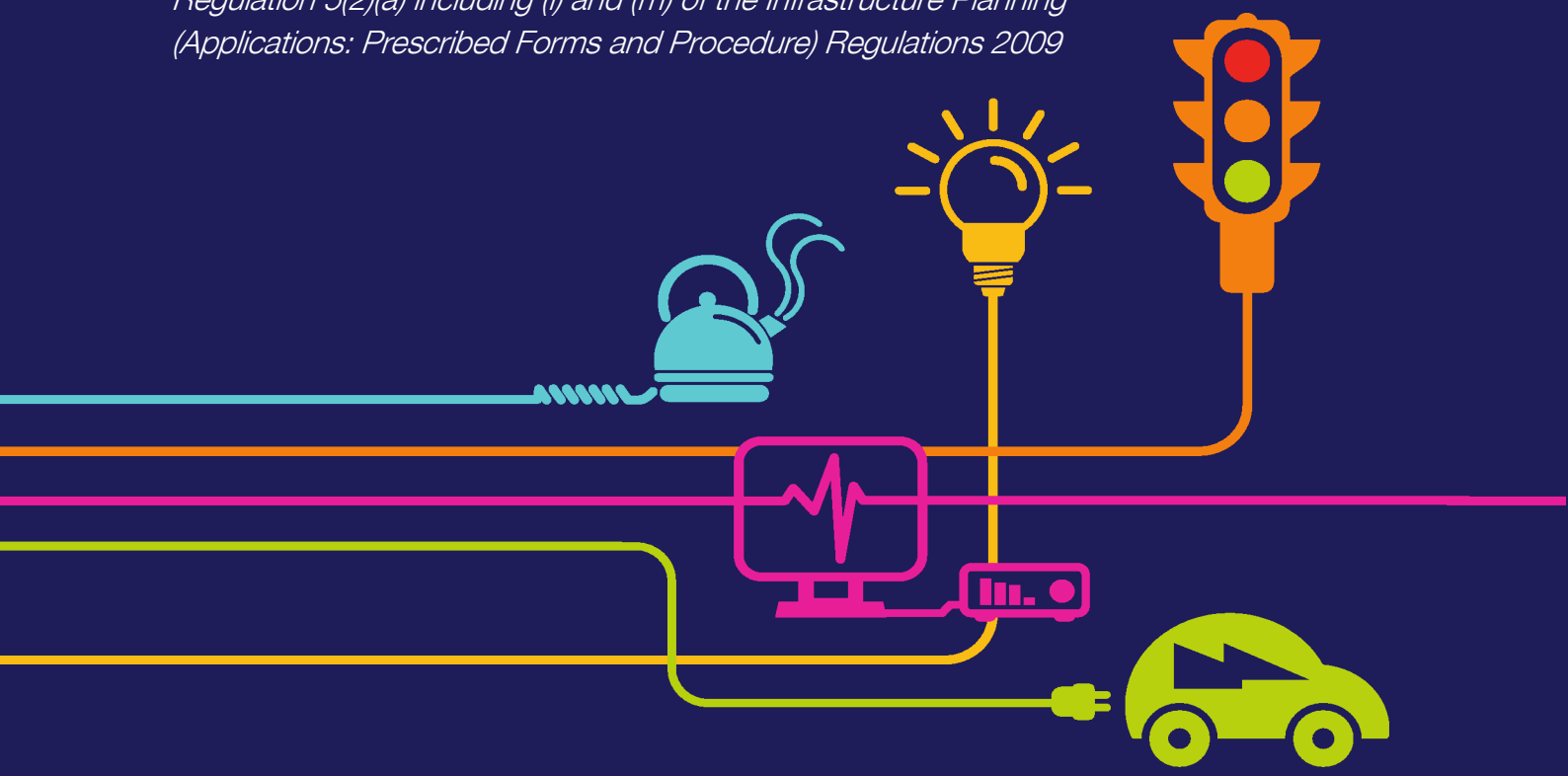
Environmental Statement Chapter 21

Statement of Combined Effects with the Wider Works

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



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1 Introduction

1.1 INTRODUCTION

1.1.1 In addition to the connection between Wylfa Substation and Pentir Substation, work is required to strengthen National Grid's existing electricity network between Pentir and Trawsfynydd to ensure that all the power generation in North Wales can be accommodated on the transmission system following the connection of Wylfa Newydd Power Station. These works are referred to as the 'Wider Works'.

1.1.2 The Wider Works do not form part of the Proposed Development, as they would be required regardless of the need for the Proposed Development, and will therefore not be consented in the Development Consent Order (DCO) under the Planning Act 2008 (Ref 21.1). The Wider Works will be consented, where appropriate, under the Town and Country Planning Act 1990 (as amended) (Ref 21.2) or Section 37 of the Electricity Act 1989 (Ref 21.3) and will be supported by the appropriate level of environmental assessment.

1.1.3 To ensure that any potential for greater environmental effects due to the Proposed Development and the Wider Works combined is identified, an assessment of combined effects has been undertaken, the results of which are reported within this Statement of Combined Effects.

1.2 WIDER WORKS

1.2.1 Scottish Power Manweb plc, known herein as SP Manweb, is the local Distribution Network Operator (DNO) in North Wales. Currently one of the two circuits on the overhead line (OHL) between Pentir Substation and Trawsfynydd Substation is operated at 132 kilovolts (kV) by SP Manweb as part of their local distribution network. This is used to supply power to the Llyn Peninsula and it also carries power from Trawsfynydd Substation to Four Crosses Substation.

1.2.2 In order to strengthen National Grid's existing electricity network between Pentir Substation and Trawsfynydd Substation, to ensure that all the proposed new power generation in North Wales can be accommodated, and also to maintain the SP Manweb distribution supply, National Grid and SP

Manweb have considered the most appropriate means by which both can be achieved.

1.2.3 It has been established that the following works are needed and are illustrated on Figure 21.1 **(Document 5.21.1.1)**.

- new 400 kV substation at Bryncir;
- new connection between the new Bryncir Substation and the existing 132 kV OHL and removal of a section of existing 132 kV OHL between the existing 4ZC OHL and the location of the new connection;
- replacement of one existing pylon at Bryncir to connect to the new substation;
- upgrading/replacement of cables at the Glaslyn Estuary;
- upgrades to the existing Cable Sealing End Compounds (CSECs) at Wern and Garth;
- extension within the existing substation boundary at Trawsfynydd substation; and
- reconductoring of one circuit on the existing OHL (4ZC) between Penisa'r Waun and Trawsfynydd Substation.

2 Description of the Wider Works

2.1 INTRODUCTION

2.1.1 The following sections provide a description of the elements listed in section 1.2.3. Figure 21.1 **(Document 5.21.1.1)** illustrates the location of each of the elements.

2.2 BRYNCIR SUBSTATION

2.2.1 The function of Bryncir Substation would be to take power from the existing Pentir – Trawsfynydd 400 kV OHL, transforming it to a voltage of 132 kV and connecting this to the existing 132 kV distribution network operated by SP Manweb.

Site Description

2.2.2 The proposed Bryncir Substation would be located in Gwynedd in north-west Wales, centred on Grid Reference SH 485 430.

2.2.3 The area within which the Bryncir Substation would be located consists of a series of open fields on the eastern side of the existing 400 kV OHL, approximately 1.4 kilometres (km) south of Bryncir and 1.4 km west of Garndolbenmaen. The A487 is located 250 metres (m) to the north-east and the B4411 and the Afon Dwyfach is 450 meters (m) to the north-west. Its primary use is agricultural and the Agricultural Land Classification (ALC) is of non-Best and Most Versatile (BMV) quality; comprising Subgrade 3b (moderate quality) and Grade 5 (very poor quality) land.

2.2.4 The substation site lies at approximately 95 m Above Ordnance Datum (AOD) on relatively flat ground and consists of pastoral fields with an area of marshy grassland located to the south-west. The site is surrounded by a mix of field boundary types, being predominantly dry stone wall and post and wire fences, but with overgrown hedgerows/hedgerow trees located along the southern boundary and along the north-eastern boundary. Managed hedgerows line the southern boundary of the A487 as it faces the substation site.

2.2.5 The existing Pentir to Trawsfynydd 400 kV OHL runs along the western edge of the substation site. A Public Right of Way (PRoW, Footpath 18

Dolbenmaen) currently runs through the substation site and would need to be permanently diverted to facilitate the substation.

2.2.6 The site is accessed from the north via the A487, which runs in a broadly east-west orientation. The B4411 runs in a broadly north-south orientation approximately 400 m to the west of the substation site and a local road passes approximately 875 m to the east, connecting the A487 to the B4411.

2.2.7 There are a number of isolated properties in the vicinity of the substation site; a small group is located close to the junction of the B4411 and the A487, approximately 500 m north-west of the site.

The Proposed Substation

2.2.8 A secure 400 kV substation compound would be required to accommodate the single electrical transformer that would 'step down' the 400 kV voltage of the Pentir – Trawsfynydd circuit to a voltage of 132 kV, ready for connection to the SP Manweb Four Crosses circuit.

2.2.9 The compound footprint dimensions would be approximately 88 x 63 metres and would be surfaced with stone chippings. Under normal operating conditions the site would be unmanned. Whilst external lighting would be installed at the substation for emergency work during hours of darkness, the substation would not normally be lit.

2.2.10 Table 21.1 lists the equipment to be installed at the substation:

Table 21.1 Equipment to be Installed at Bryncir Substation

Equipment	Description
Ancillary Buildings	A small single storey amenities building and small single storey building housing the main control systems.
Busbars and Air Insulated Switch Gear (AIS) (1 X 400 kV And 1 X 132 kV)	Busbars are similar in appearance to scaffolding poles, and carry electrical power around the substation to various equipment.
Earth Switches (9 x 400 kV and 9 x 132 kV)	An earth switch enables safe maintenance of the substation equipment.
Disconnectors (3 x 400 kV & 3 x 132 kV)	A disconnector provides an electrical break between the circuits.

Table 21.1 Equipment to be Installed at Bryncir Substation	
Equipment	Description
Circuit Breakers (3 x 400 kV and 3 x 132 kV)	A circuit breaker provides a high speed method of isolating circuit components in the event of a fault on the transmission or distribution networks.
Cable Sealing Ends (x3)	Used where high voltage underground cable joins onto an OHL or busbar.
Current Transformers (x6)	Converts system current to levels which can be safely measured by control and protection equipment. They are positioned so that no part of the network is left unmonitored by protection systems.
Settlement Metering (x3)	Provides a measurement of the power transferred from National Grid to SP Manweb at Bryncir.
Diesel Generator	Provides standby Low voltage alternating current (LVAC) supplies in event of a power failure.
Gantry	A structure, up to 10.5 m in height, which supports electrical conductors as they transition from an OHL pylon to busbars and equipment within a substation.
LVAC Transformer	Site electrical 230 volts (V) supplies.
Super Grid Transformer (1 X 400/132 kV)	Required to change line voltage to a higher or lower level and regulate the voltage.
Surge Arresters (3x 400 kV & 3x 132 kV)	A Surge Arrester provides a path to earth when triggered by an abnormal voltage condition (e.g. lightning strike) to protect key equipment.
Voltage Transformers (3 x 400 kV & 4 x 132 kV)	Converts system voltage to levels which can be safely measured by control and protection.
Water Tank	Water source for firefighting.
Oil Interceptor	Separates water from contaminates such as oil, grease and sediment.

Table 21.1 Equipment to be Installed at Bryncir Substation	
Equipment	Description
Access Road and Heavy Good Vehicles (HGV), Turning Area	Access to the site would be from the A487 using an upgraded existing access point located opposite Bryn-yr-efail-uchaf, before following field boundaries to the substation compound. The permanent access track would be approximately 550 m long with a maximum width of 6 m and would have a tarmacadam surface. In addition a hardstanding area, immediately adjacent to the south of the compound would be required to accommodate vehicle turning.
Security Fencing	2.4 m high palisade fencing with an electric fence backing of 3.4 m height from ground level.

2.3 NEW CONNECTION BETWEEN THE NEW BRYNCIR SUBSTATION AND THE EXISTING 132 KV OHL

2.3.1 Bryncir Substation would need to be connected to the SP Manweb distribution network via the existing 132 kV OHL to the west of the substation. This is illustrated on Figure 21.1 (**Document 5.21.1.1**).

2.3.2 The new connection between the proposed Bryncir Substation and the existing 132 kV OHL would likely be a hybrid of both cable and OHL. The cable section would run from the north of the substation under the 4ZC OHL along the boundary edge of the field to terminate at a double pole structure. A trident OHL would then run over the road down the embankment and over the river to connect to the existing 132 kV OHL via a four pole structure. The trident poles would be approximately 11 m in height.

2.3.3 The new connection would mean that a section of the existing 132 kV OHL would be removed.

2.4 REPLACEMENT OF ONE EXISTING PYLON AT BRYNCIR TO CONNECT TO THE NEW BRYNCIR SUBSTATION

2.4.1 In order to achieve the connection of the Bryncir Substation to the existing network it would be necessary to replace one existing pylon (4ZC067). The replacement pylon (4ZC067R) would be a tension pylon as opposed to the existing suspension pylon and would be sited on the existing OHL between

two existing pylons, 25 m to the north of the existing (4ZC067) pylon. The new pylon would be 1 m greater in height than the existing pylon. Once the work to connect the new pylon has been completed, the existing pylon closest to the new one would be removed.

2.5 UPGRADING/REPLACEMENT OF CABLES AT THE GLASLYN ESTUARY

2.5.1 In order to strengthen National Grid's existing electricity network it is necessary to install an additional 400 kV circuit and replace the existing circuit at Glaslyn Estuary as the existing cables are coming to the end of their operational life and are not capable at accommodating the additional 400 kV circuit.

2.5.2 In order to replace the existing cables and to accommodate the additional capacity new cables would be required. The proposed route of the new cables is approximately 6 km between the existing CSECs at Wern and Garth centred on at Grid References SH 543 401 and SH 596 387 respectively. This is illustrated on Figure 21.1 (**Document 5.21.1.1**). The cables cannot be replaced in-situ as more space is required to accommodate the additional capacity required. The new route also allows an element of off- line build which will reduce the disruption to the grid network.

2.6 UPGRADES TO THE EXISTING CSECS AT WERN AND GARTH

Wern CSEC

2.6.1 The extension to Wern CSEC would be within National Grid's existing operational boundary. The size of the site within the ownership boundary would increase from approximately 22 m x 46 m to 34 m x 48 m.

2.6.2 Table 21.2 lists the equipment likely to be installed and removed at the CSEC.

Table 21.2 List of Equipment to be Installed and Removed at Wern CSEC

Equipment	Description
Equipment to be Installed	
CSEs	Used where high voltage underground cable joins onto an OHL.
Busbars	Connects the OHL and equipment within

Table 21.2 List of Equipment to be Installed and Removed at Wern CSEC	
Equipment	Description
	the CSEC.
Fence Line	A section of existing fence will be removed to allow for the extension of the CSEC.
Equipment to be Removed	
Fence Line	A section of new fence will be erected around the extended CSEC.

Garth CSEC

2.6.3 The extension to Garth CSEC would also be within National Grid's existing operational boundary. The size of the site within the ownership boundary would increase from approximately 23 m x 49.5 m to 41.5 m x 52.5 m.

2.6.4 Table 21.3 lists the equipment likely to be installed and removed.

Table 21.3 List of Equipment to be Installed and Removed at Garth CSEC	
Equipment	Description
Equipment to be Installed	
CSEs	Used where high voltage underground cable joins onto an OHL.
Busbars	Connects the OHL and equipment within the CSEC.
Fence Line	The existing fence will be removed to allow for the extension of the CSEC.
Equipment to be Removed	
Fence Line	A section of new fence will be erected around the extended CSEC.

2.7 EXTENSION WITHIN THE EXISTING SUBSTATION BOUNDARY AT TRAWSFYNYDD SUBSTATION

2.7.1 To accommodate the additional capacity, work would be required to the existing substation at Trawsfynydd; the work would be wholly within the existing footprint of the substation.

2.7.2 Table 21.4 lists the typical equipment to be installed.

Table 21.4 List of Equipment to be Installed at Trawsfynydd Substation

Equipment	Description
Equipment to be Installed	
HV Cable Sealing End Equipment	In this instance the Cable Sealing End (CSE) is where the High Voltage (HV) cable transitions for connection to the Air Insulated or Gas Insulated equipment.
Earth Switches (X3 400 kV)	An earth switch establishes a connection between the equipment and the earth, making the equipment safe to work on.
Voltage Transformers (X3)	Convert system voltage to levels which can be safely measured by control and protection equipment.
Current Transformers (X3)	Convert system current to levels which can be safely measured by control and protection equipment. Positioned so that no part of the network is left un-monitored by protection systems.
Disconnector/Earth Switch (1x 400 kV)	An earth switch establishes a connection between the equipment and the earth, making the equipment safe to work on.
Busbars & Connectors	Busbars are connections which carry electrical power around the substation to various equipment.

2.8 RECONDUCTORING OF ONE CIRCUIT ON THE EXISTING OHL (4ZC) BETWEEN PENISA'R WAUN AND TRAWSFYNYDD SUBSTATION

2.8.1 One circuit on the existing OHL (4ZC) requires reconductoring between Penisa'r Waun and Trawsfynydd Substation. This is illustrated on Figure 21.1 (**Document 5.21.1.1**).

2.8.2 The reconductored section would also be uprated to operate at 400 kV, meaning that following completion of the works both circuits along the entire 4ZC between Pentir and Trawsfynydd would operate at 400 kV.

3 Construction, Operation Maintenance & Decommissioning

3.1 INTRODUCTION

3.1.1 This section describes how the various elements of Wider Works would be constructed, operated, maintained and decommissioned.

3.2 CONSTRUCTION PROGRAMME

3.2.1 The high level construction programme is shown in Table 21.5.

Table 21.5 High Level Construction Programme for Wider Works

Year	2020				2021				2022				2023				2024			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Bryncir Substation																				
New 132 kV connection																				
4ZC pylon replacement																				
Glaslyn Cables including Wern and Garth CSEC																				
Trawsfynydd Substation																				
4ZC reconductoring																				

3.3 BRYNCIR SUBSTATION

Construction

3.3.1 Prior to the main construction works, access to the site would be constructed off the A487. During construction a range of vehicles would access the site including concrete lorries, HGVs, articulated lorries and one Abnormal Indivisible Load (AIL) carrying the transformer. The forecasted average number of light vehicle trips per day (two way) would be 51 and average number of HGV trips per day (two-way) would be 6.

3.3.2 A temporary construction compound would be established adjacent to the proposed substation to allow for the safe construction of the permanent operational substation high voltage compound. The construction compound area generally would comprise temporary cabins for offices and for welfare facilities for construction site workers. There also would be allocated areas for parking, receiving deliveries, for storage of materials and equipment and (where required) for storage of waste items to be removed.

3.3.3 The number of construction workers would fluctuate throughout the construction programme, and is expected to peak at around 50.

3.3.4 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. If possible, the permanent site boundary perimeter fencing would be completed early in the construction programme to secure the construction area. Electrification of the fence would take place as the substation is fitted out with lighting and power. Where required, excavations, piling and concrete foundations would be provided for the substation electrical equipment. 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 then would be erected.

3.3.5 Prior to the substation being brought into service, commissioning tests would be required, starting with testing the individual items of plant and culminating with testing the installed system as a whole. Following successful testing, the substation would be connected to the electricity transmission system. Following commissioning the site offices and temporary facilities would be removed, land reinstatement, utilising the stored top soil and landscape works, would be undertaken.

Operation and Maintenance

3.3.6 The substation would typically be unmanned. Maintenance of the substation would be undertaken approximately every three years, involving electrical isolation of equipment before it is worked on. Visual checks would be undertaken on a monthly inspection visit to the site. If the substation requires 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.

Decommissioning

3.3.7 The lifespan of the equipment within the proposed substation would be approximately 40 years. However, the substation would form part of the national electricity transmission network which feeds power supply into the local community and therefore would be likely to continue to be required. If its useful life has expired, the equipment would be safely disconnected from the transmission system, carefully dismantled, and removed. Much of the material of the substation would be taken for recycling. Similar methods and equipment would be required for dismantling as for construction.

3.4 NEW CONNECTION BETWEEN THE NEW BRYNCIR SUBSTATION AND THE EXISTING 132 KV OHL

Construction

3.4.1 Construction of the new connection would involve the following:

- preparation of temporary accesses;
- establishment and preparation of the working area/construction corridor;
- excavation of cable trench (to 1.5 m) and foundations for poles and stays (these would be auger bore and possibly concrete);
- delivery of poles and cables (wrapped around drums);
- cable installation (pulled off the drums onto rollers within the trenches);
- erection of three pole structures from a machine (hi-ab on lorry);
- delivery of conductor drums and stringing equipment;
- insulator and conductor erection and sagging; and

- clearance and reinstatement.

3.5 GLASLYN CABLES

Construction

3.5.1 The new cables would be installed through a combination of open cut (direct burial) and non-open cut (Horizontal Directional Drilling (HDD)) techniques. HDD is a steerable trenchless method of installing underground pipes, conduits and cables.

3.5.2 For the sections where direct burial installation would be utilised a temporary working corridor would be established along the route. Installation activities would occur within the temporary working corridor which would include the cable trench, temporary haul road, storage areas for top and sub soils, drainage. The working corridor would be fenced to suit the land owners and stakeholder requirements (mixture of stockproof and herris fencing) during the construction period.

3.5.3 The working corridor would need to be cleared of vegetation. Trenches would be excavated and cables would be laid in each of the trenches on a bed of Cement Bound Sand (CBS). Once cables have been laid, reinstatement works would begin. The temporary haul road and any temporary access tracks would be removed and the stored top and sub soils replaced. Any fencing used in construction would then be removed. The land would be reinstated to its previous condition and use, wherever possible.

3.5.4 Joints in the cables would be required at least every 750 - 1000 m, at each cable joint there would be an above ground kiosk (link pillar), of approximately –1.2 m wide, 0.5 m deep and by 1.2 m high. The link boxes would be used to monitor and occasionally test the underground cables.

3.5.5 Where the route would be installed via HDD, a launch (drilling site) and reception (exit site) working site would be established along with site accesses. The drill rig would be set-up within the drilling compound which would drill to the exit. Spoil would be placed in temporary storage areas within the compounds. Pipes are pulled back through the drilled hole by the drilling rig in one continuous length to form permanent ducts within which the cables would be installed. Following the installation the equipment would be removed from site and the working areas reinstated.

3.5.6 In addition to the HDD drilling and exit sites two temporary contractor's compounds and offices would be established to house the staff, provide staff parking and to store equipment and materials for the works.

3.5.7 There is expected to be in the order of 150 two-way vehicle movements per day in the peak month of construction. Of these movements, the majority will be LGV and car movements.

3.5.8 All the cable bridges along the current route would be removed.

3.5.9 In addition all the cable bridges along the current Glaslyn Cable would be removed and the existing cables would be decommissioned by either leaving in-situ (cut and capping the cables following the oil being purged from them) or full removal by open cut methods.

Operation and Maintenance

3.5.10 The underground cable has a design life of 40 years and cable checks would be required periodically. Testing of the cables would take place once every three years at link boxes and the CSEC. The underground cables have above ground kiosks at the joints to monitor the cables. Monitoring would be carried out remotely via fibre optic cables installed with the underground cables. Should a fault develop the cable would be repaired. The area where the fault is located would be accessed via a temporary trackway and/or temporary access made up of crushed stone (MOT Type 1 or similar), a working area established and the ground excavated. If a cable needs to be replaced then the section of the cable (between two joints) would need to be removed and new joints constructed.

Decommissioning

3.5.11 The anticipated operational life of the underground cable would be approximately 40 years, however, this could be extended should components be replaced. If the connection between Wern and Garth were no longer required, the underground cable would be decommissioned and either left in situ or removed. If the underground cables were to be removed upon decommissioning, similar methods and access would be required as outlined for installation.

3.6 WERN AND GARTH CSECS

Construction

3.6.1 The extension to the CSECs to accommodate the new cables would utilise the existing access roads as far as possible. The underground cables would be channelled via the troughs onto the cable sealing end structures. The cable sealing end terminations, line gantries and other electrical equipment, such as earth switches, would be lowered onto their foundations and support structures by a mobile crane. The cable sealing ends 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 OHL to the underground electrical cables via downleads. Downleads bring the conductors down to join on to where the ends of the underground cables come out of the ground.

Operation and Maintenance

3.6.2 Infrequent visits would be made to the CSECs to monitor the underground cables and carry out periodic maintenance and checks on electrical equipment within the compound. When the CSECs requires refurbishment and/or replacement works, 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 scaffolding may be required to protect any infrastructure around the compound.

Decommissioning

3.6.3 The lifespan of a CSEC is approximately 40 years. Any relays used for protection and control purposes in the small control building would typically have a life of 15 years. When the CSECs useful life has expired the materials would be removed and taken for recycling where possible.

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

3.7 TRAWSFYNYDD SUBSTATION

3.7.1 The current proposals would be wholly contained within the footprint of the existing substation, and access would be made via the existing access point.

Construction

3.7.2 A temporary construction compound would be established within the existing substation compound. The construction compound area would generally comprise temporary cabins for offices and for welfare facilities for construction site workers. There also would be allocated areas for receiving deliveries, for storage of materials and equipment and (where required) for storage of waste items to be removed.

Operation and Maintenance

3.7.3 Maintenance of the substation would be undertaken approximately every 3 years, involving electrical isolation of equipment before it is worked on. Visual checks would be undertaken on a monthly inspection visit to the site. If the substation requires 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.

Decommissioning

3.7.4 The lifespan of a substation is approximately 40 years. If its useful life has expired and it is to be removed, the equipment would be safely disconnected from the transmission system and carefully dismantled. Much of the material of the substation would be taken for recycling. Similar methods and equipment would be required for dismantling as for construction.

3.7.5 If the North Wales Connection were no longer required it is likely the equipment relating to the connection would be removed from Trawsfynydd Substation in accordance with the above. As Trawsfynydd Substation accommodates the wider transmission network the substation would remain as long as it is required.

3.8 4ZC RECONDUCTORING

Conductor Stringing

3.8.1 The wires (conductors) of the OHL would be delivered to pulling positions by lorries (approx. 38 tonnes) with the conductors wrapped around cable drums. Tractors and other smaller vehicles would be used to transport the drums and other materials along the temporary access roads. The conductors would usually be installed in sections between tension pylons where the line changes direction. A pulling site would be established at one end of the section with the conductors running out from a tensioning site at the other end of the section.

3.8.2 Pilot wires would be laid at ground level (and over temporary scaffolding protecting obstacles such as roads and railway lines) along the length of the section between the pulling site and the tension site. The pilot wires would be lifted and fed through running wheels on the cross arms of all the pylons in the middle of the section, and then fed around the pulling machine at the pulling site. The tensioning machine would keep the wires off the ground and prevent the conductors running freely when the pulling machine pulls

the pilot wire. In rare cases when it is not possible to run the pilot wires from ground level, helicopters may be used to pull them through. When the conductor is fully ‘run out’, it would be fastened at its finished tension and height above ground by a linesmen working from platforms on the pylons and suspended from the conductors. Additional fittings such as, spacers and dampers, would be fitted to the conductors. Spacers prevent the conductors from touching each other and dampers prevent oscillations in the overhead conductors.

4 Potential Combined Effects

4.1 INTRODUCTION

4.1.1 Combined effects would result where a particular receptor, or group of receptors, would be affected by both the Proposed Development and the Wider Works together; these receptors are referred to hereafter as 'combined receptors'.

4.1.2 Table 17.1 of the Scoping Report (Ref 20.4) and Table 20.6 of the Preliminary Environmental Information Report (PEIR) (Ref 20.5) provided a screening assessment of the potential for effects on combined receptors for each of the topics being considered. The majority of the Wider Works would be geographically remote from the Proposed Development; this reduces the potential for there to be combined receptors.

4.1.3 As the proposals for the elements of the Wider Works have progressed the list of potential combined receptors has been reviewed and updated. Since the publication of the Scoping Report (Ref 20.4) and PEIR (Ref 20.5) a number of topics have screened out elements of the Wider Works from further assessment, as no combined receptors have been identified. Table 21.6 summarises the topics with identified combined receptors.

4.1.4 The screening assessment has concluded that combined receptors have been identified for all topics except for Geology, Hydrogeology and Ground Conditions, Hydrology, Water Resources and Flood Risk and Operational Noise. These topics have therefore not been taken through to the assessment stage.

Table 21.6 Wider Works Combined Receptors Screening							
Topic	Bryncir Substation	New 132 kV Connection	Replacement Pylon	Glaslyn Cables	Wern and Garth CSEC	Trawsfynydd Substation	Reconductoring of the 4ZC
Landscape	Out	Out	Out	Out	Out	Out	In
Visual	Out	Out	Out	Out	Out	Out	In
Ecology and Nature Conservation	Out	Out	Out	Out	Out	Out	In
Historic Environment	Out	Out	Out	Out	Out	Out	In
Geology, Hydrogeology and Ground Conditions	Out	Out	Out	Out	Out	Out	Out
Water Quality, Resources and Flood Risk	Out	Out	Out	Out	Out	Out	Out

Table 21.6 Wider Works Combined Receptors Screening

Topic	Bryncir Substation	New 132 kV Connection	Replacement Pylon	Glaslyn Cables	Wern and Garth CSEC	Trawsfynydd Substation	Reconductoring of the 4ZC
Traffic and Transport	In	In	Out	In	In	In	Out
Air Quality and Emissions	In (traffic only)	In (traffic only)	Out	In (traffic only)	In (traffic only)	In(traffic only)	Out
Construction Noise and Vibration	In (traffic only)	In (traffic only)	Out	In (traffic only)	In (traffic only)	In(traffic only)	In (maintenance only)
Operational Noise	Out	Out	Out	Out	Out	Out	Out
Socio Economics	In	In	Out	In	In	In	In
Agriculture	In	In	In	In	Out	Out	In

4.2 POTENTIAL COMBINED EFFECTS

4.2.1 Where elements of the Wider Works have been screened into the combined effects assessment the following table (Table 21.7) lists the combined receptors and provides an assessment of the combined effects on the identified receptors.

Table 21.7: Assessment of Combined Effects				
Topic	Wider Works	Combined Receptors	Assessment of Combined Effects	Combined Effect?
Landscape	Reconductoring of the 4ZC	Landscape Character Areas: • Caernarfon Coast & Plateau; • Penisa'r Waun Plateau; • Bangor Coastal Plain; and • Llanberis Bethesda. North-western fringes of Snowdonia Special Landscape Area (SLA) Snowdonia National Park Anglesey Area of Outstanding Natural Beauty (AONB).	**Construction:** Replacing the earthwire and reconductoring (routine refurbishment involving no new infrastructure) on the 4ZC line would have construction effects, due to the presence of equipment, scaffolding, pulling positions and access tracks within the landscape, although these effects would be temporary in duration. These works in combination with the Proposed Development could result in a slight increase in significance to landscape receptors in the short-term, particularly for areas immediately surrounding Pentir, which is located on the boundary of the Bangor Coastal Plain and Caernarfon Coast & Plateau Landscape Character Areas. However, these landscape effects would be localised and would not change the reported level of significance for the Proposed Development alone. Due to distance, there would be no anticipated increase to the significance of landscape effects on the SLA, AONB and National Park. **Operation:** There would be no operational effects as a result of the reconductored 4ZC line and	No increase in the significance reported for the Proposed Development alone.

Table 21.7: Assessment of Combined Effects				
Topic	Wider Works	Combined Receptors	Assessment of Combined Effects	Combined Effect?
			therefore no increase in the significance of operational effects reported for the Proposed Development alone. **Maintenance:** If maintenance works took place on the reconductored 4ZC and the Proposed Development at the same time a slight increase in significance to landscape receptors in the short-term could result, particularly for areas immediately surrounding Pentir. However, these landscape effects would be localised and would not change the reported level of significance for the Proposed Development alone.	
Visual	Reconductoring of the 4ZC	Properties in the area surrounding Rhiwlas, Pentir, Seion, Llanddeiniolen and Penisa'r Waun Visitors to Snowdonia National Park and using surrounding Open Access Land Views from the local	**Construction:** From more elevated properties, PRoW and roads with long distance views e.g. Rhiwlas and surrounding hills, there would be views of both the construction works at Pentir as part of the Proposed Development and the earthwire/reconductoring works on the 4ZC line. The presence of equipment, scaffolding, pulling locations and access tracks for the 4ZC may be seen together with construction works to the substation at Pentir and Tŷ Fodol Tunnel Head House (THH) and CSEC, although these effects	No increase in the significance reported for the Proposed Development alone.

Table 21.7: Assessment of Combined Effects				
Topic	Wider Works	Combined Receptors	Assessment of Combined Effects	Combined Effect?
		PRoWs and road network.	would be temporary in duration. These works in combination with the Proposed Development are predicted to result in a slight increase in significance to visual receptors in the short-term, but the overall level of significance reported for the Proposed Development alone would not change. **Operation:** There would be no operational effects as a result of the reconductored 4ZC line and therefore no increase in the significance of operational effects reported for the Proposed Development alone. **Maintenance:** If maintenance works took place on the reconductored 4ZC and the elements of the Proposed Development located in the vicinity of Pentir at the same time a slight increase in significance to visual receptors in the short-term could result. However, these effects would be short-term and would not change the reported level of significance for the Proposed Development alone.	
Ecology and Nature	Reconductoring of the 4ZC	Wider ranging species of birds and	**Construction:** Temporary combined effects during construction could occur in the vicinity of	No increase in the

Table 21.7: Assessment of Combined Effects				
Topic	Wider Works	Combined Receptors	Assessment of Combined Effects	Combined Effect?
Conservation		mammals.	Pentir Substation. The effects of replacing the earthwire and reconductoring on the 4ZC line could have construction effects from the presence of equipment, scaffolding, pulling locations and access tracks having temporary land take and disturbance on species associated with those habitats affected. Overall these works in combination with the Proposed Development would not change the level of significance reported for the Proposed Development alone. **Operation:** There would be no operational effects as a result of the reconductored 4ZC line and therefore no increase in the significance of operational effects reported for the Proposed Development alone. **Maintenance:** If maintenance works took place simultaneously on the reconductored 4ZC and the Proposed Development in the vicinity of Pentir Substation, temporary combined effects on more mobile species through temporary habitat loss could theoretically occur. As the reconductoring of 4ZC is 4 km away from Pentir, it is considered unlikely that combined effects would be more	significance reported for the Proposed Development alone.

Table 21.7: Assessment of Combined Effects				
Topic	Wider Works	Combined Receptors	Assessment of Combined Effects	Combined Effect?
			significant than each element of work alone, therefore would not increase the reported level of significance for the Proposed Development alone.	
Historic Environment	Reconductoring of the 4ZC	Dinorwig Historic Landscape	**Construction:** During construction there could be a potential combined effect on the Dinorwig Historic Landscape, as a result of changes in the settings of assets within the vicinity of Pentir Substation. However given the distance between the closest section of reconductoring and the works at Pentir, it is considered unlikely that effects would combine to the extent that effects would be of greater overall significance. The effects would more likely be sequential than concurrent, so the effect would be one of increased duration rather than both construction areas being visible at the same time. Overall the level of significance reported for the Proposed Development alone would not change. **Operation:** There is not anticipated to be any operational effects as a result of the reconductored 4ZC line and therefore no increase in the significance of operational effects reported for the Proposed Development alone.	No increase in the significance reported for the Proposed Development alone.

Table 21.7: Assessment of Combined Effects				
Topic	Wider Works	Combined Receptors	Assessment of Combined Effects	Combined Effect?
			Maintenance: Given the distance between the closest section of reconductoring and Pentir Substation, combined effects during maintenance effects are considered unlikely and the reported level of significance for the Proposed Development alone would not change.	
Traffic and Transport	Bryncir Substation New 132 kV Connection Glaslyn Cables Wern and Garth CSEC Trawsfynydd Substation	The A487 subject to vehicle routeing.	**Construction**: Due to the distance between the Wider Works and the Proposed Development, the potential for combined effects is limited; however, construction traffic has the potential to interact on combined construction traffic routes, either by increasing peak traffic flows or prolonging effects where works occur consecutively. The limited amount of traffic associated with the Wider Works (other than Glaslyn Cables) and the fact that the potential combined construction route is not considered to be sensitive to changes in traffic flows, means that overall the level of significance reported for the Proposed Development alone would not change. The construction programme for Glaslyn Cables is anticipated to see construction complete within 16 months, and the volumes of construction traffic	No increase in the significance reported for the Proposed Development alone.

Table 21.7: Assessment of Combined Effects				
Topic	Wider Works	Combined Receptors	Assessment of Combined Effects	Combined Effect?
			vehicles are likely to peak for one or two months in the middle of the construction programme. The most up-to-date information available indicates that there is expected to be in the order of 150 two-way vehicle movements per day in the peak month of construction. Of these movements, the majority will be LGV and car movements, will be spread throughout the works area, will be confined to Gwynedd and are highly unlikely to all use the shared Highway Link 18. Even though the Glaslyn Cables work would lead to a slightly higher traffic numbers, it is expected that a Construction Traffic Management Plan (CTMP) would be produced for each aspect or works to manage construction traffic, particularly HGVs, to and from the proposed work sites. This would mean that overall the level of significance reported for the Proposed Development alone would not change. **Operation:** There would be very little potential for vehicle traffic during operation of either the Proposed Development or Wider Works, and therefore the combined effects would not change the reported level of significance for the Proposed	

Table 21.7: Assessment of Combined Effects				
Topic	Wider Works	Combined Receptors	Assessment of Combined Effects	Combined Effect?
			Development alone. **Maintenance:** The numbers of vehicle movements associated with maintenance would likely be low. As such, combined effects would not change the reported level of significance for the Proposed Development alone.	
Air Quality and Emissions	Bryncir Substation New 132 kV Connection Glaslyn Cables Wern and Garth CSEC Trawsfynydd Substation	Sensitive receptors (residential properties, educational and medical facilities) located along the A487 subject to construction vehicle routeing.	**Construction:** Due to the relatively small overlap in study areas between the Wider Works and the Proposed Development, combined effects would not change the reported level of significance for the Proposed Development alone. **Operation:** There would be no potential for significant operational effects of the Proposed Development, and therefore no potential for combined effects. **Maintenance:** Due to the relatively small overlap in study areas between the Wider Works and the Proposed Development, as such combined maintenance effects would not change the reported level of significance for the Proposed Development alone.	No increase in the significance reported for the Proposed Development alone.
Construction Noise and	Bryncir Substation	Potential combined noise sensitive	**Construction:** Due to the relatively small overlap	No increase

Table 21.7: Assessment of Combined Effects				
Topic	Wider Works	Combined Receptors	Assessment of Combined Effects	Combined Effect?
Vibration	New 132 kV Connection Glaslyn Cables Wern and Garth CSEC Trawsfynydd Substation Reconductoring of the 4ZC	receptors along the A487 subject to construction vehicle routeing.	in study areas between the Wider Works and the Proposed Development, combined effects would not change the reported level of significance for the Proposed Development alone. **Operation:** Not applicable. **Maintenance:** Due to the relatively small overlap in study areas between the Wider Works and the Proposed Development, and the low volumes of traffic anticipated, combined maintenance effects would not change the reported level of significance for the Proposed Development alone.	in the significance reported for the Proposed Development alone.
Socio Economics	Bryncir Substation New 132 kV Connection Glaslyn Cables Wern and Garth CSEC Trawsfynydd Substation	Tourism sector	**Construction**: General disturbance could affect visitors' perceptions of the area and consequently reduce visitor numbers/associated expenditure. There is potential for construction of the Proposed Development to affect the tourism sector as a result of specific, or a combination of, amenity effects, accommodation demand effects, effects on visitor numbers, and employment and expenditure effects. This would not increase the significance of effects reported for the Proposed Development alone given the distance between the works.	No increase in the significance reported for the Proposed Development alone.

Table 21.7: Assessment of Combined Effects				
Topic	Wider Works	Combined Receptors	Assessment of Combined Effects	Combined Effect?
			Operation: No cumulative operational effects would be anticipated given the distance between the works and the Proposed Development; therefore, no increase in the significance of operational effects is reported for the Proposed Development alone. **Maintenance:** Given the distance between the works, combined effects would not increase the reported level of significance for the Proposed Development alone.	
	Reconductoring of the 4ZC	Communities within the ZTV for both the Proposed Development and the Reconductoring works (TBD).	**Construction** Detrimental effects on amenity are generally considered to arise when visual, traffic, air quality and noise effects coincide on a particular area or receptor; however, for each of them alone there is considered to be no or negligible effects. Detrimental effects on community amenity are generally considered to arise when amenity effects have the potential to change how people perceive their communities, or how they use community facilities such as schools and places of worship. Negligible effects are not considered likely to	No increase in the significance reported for the Proposed Development alone.

Table 21.7: Assessment of Combined Effects				
Topic	Wider Works	Combined Receptors	Assessment of Combined Effects	Combined Effect?
			accumulate to cause a combined effect, and certainly not one that could be considered significant. In addition, there is a distance of 4 km from the 4ZC reconductoring and Pentir Substation. The reconductoring could potentially affect the community of Pentir during construction; there would be no significant effects on the amenity of the community of Pentir as a result of the Proposed Development. The topics included in the amenity assessment (visual, traffic, construction noise and air quality) have concluded that any combined effects with the Wider Works would not result in a change in the significance of the effect of the Proposed Development. There would therefore be no increase in the significance of effects reported for the Proposed Development alone. **Operation:** There would be no significant effects on the amenity of the community of Pentir as a result of the Proposed Development. The topics included in the amenity assessment (visual and operational noise) have concluded that any	

Table 21.7: Assessment of Combined Effects				
Topic	Wider Works	Combined Receptors	Assessment of Combined Effects	Combined Effect?
			combined effects with the Wider Works would not result in a change in the significance of the effect of the Proposed Development. Therefore, there would be no increase in the significance of operational effects reported for the Proposed Development alone. **Maintenance:** Given the distance between the reconductored 4ZC and Pentir Substation combined effects would not increase the reported level of significance for the Proposed Development alone.	
Agriculture	Bryncir Substation New 132 kV Connection Replacement Pylon Glaslyn Cables Reconductoring of the 4ZC	• soil resource and agricultural drainage; • agricultural land use; and • Agri-Environment Schemes (AES).	**Construction:** The construction of the Bryncir Substation, new 132 kV Connection, replacement Pylon, the Glaslyn Cables and the reconductoring of the 4ZC would result in both temporary and permanent land take. At the Bryncir Substation site, 1.2 ha of land would undergo permanent development however, survey has shown that all agricultural land within the site is non-BMV (Subgrade 3b and Grade 5). Therefore, there would be no permanent loss of BMV land. The permanent land take associated with the 132	Agricultural land use - No increase in the significance reported for the Proposed Development alone. Soil resource, drainage and AES – no

Table 21.7: Assessment of Combined Effects				
Topic	Wider Works	Combined Receptors	Assessment of Combined Effects	Combined Effect?
			kV connection pole locations and at the replacement pylon would be limited to the small footprints of the poles and pylon, the permanent loss of agricultural land would be minimal. The laying of the Glaslyn Cables and the reconductoring of the 4ZC would only result in temporary land take and therefore there would be no permanent loss of BMV land. When considered as a whole, the Proposed Development and the Wider Works have the potential to create combined effects, but as the combined permanent loss of BMV land would remain below 20 hectares (ha), and also given that land take effects would have to be considered at a regional level, the overall level of significance reported for the Proposed Development alone would not change. The construction of the various Wider Works elements would occur in geographically discrete areas relative to the Proposed Development, therefore there would be no combined effect on soils, drainage and Agri-Environment Schemes (AES).	combined effect.

Table 21.7: Assessment of Combined Effects				
Topic	Wider Works	Combined Receptors	Assessment of Combined Effects	Combined Effect?
			Operation: Permanent loss of agricultural land is considered above. **Maintenance**: There would be no requirement for the additional permanent loss of agricultural land during maintenance therefore there are no effects to combine with the Proposed Development. As the various elements of the Wider Works are geographically discrete relative to the Proposed Development, there would be no combined effects to soils, drainage and AES as a result of maintenance works.	

4.3 SUMMARY OF ASSESSMENT

4.3.1 The above Table 21.7 identifies and assesses the potential combined effects of the Proposed Development and the Wider Works. These effects are summarised below.

Landscape and Visual

4.3.2 Due to the distance between the Wider Works and the Proposed Development combined effects would be limited to the combined effects during the reconductoring of the existing line 4ZC. Reconductoring works in combination with the Proposed Development are predicted to result in a slight increase in the effect on receptors in the short- term, but the overall level of significance reported for the Proposed Development alone would not change.

Ecology and Nature Conservation

4.3.3 Due to the distance between the Wider Works and the Proposed Development, any combined effects would be limited to the combined effects during the reconductoring of the existing 4ZC. The combined value of ecological receptors remains at a county level as the Proposed Development and reconductoring would likely affect separate populations of species, due to their geographical separation. Temporary combined effects on more mobile species through temporary habitat loss could theoretically occur during construction, as the reconductoring of 4ZC is 4 km away from Pentir Substation, however the combined effects would not change the level of significance reported for the Proposed Development alone.

Historic Environment

4.3.4 Similar to landscape and visual, due to the distance between the majority of the Wider Works and the Proposed Development the likelihood of combined effects would be very limited. The reconductoring could combine with works at Pentir Substation to result in combined setting effects to the Dinorwig Historic Landscape, but this would be most likely to be because of an extended period of construction work overall within the historic landscape. Overall the level of significance reported for the Proposed Development alone would not change.

Traffic and Transport

4.3.5 There would be the potential for combined effects on potentially combined construction traffic routes (Link 18 A487) for the Proposed Development and

the Wider Works where the construction programmes overlap or where an extended duration of effects occurs due to sequential works. The limited amount of traffic associated with Wider Works other than Glaslyn Cables means that combined effects and the fact that the potential combined construction traffic route is not considered to be sensitive to changes in traffic flows, means that overall the level of significance reported for the Proposed Development alone would not change.

Air Quality

4.3.6 Where a combined effect on construction routes has been identified there would also be the potential for combined effects on air quality. However, it is considered unlikely that these would be of greater significance than the Proposed Development alone, due to limited traffic movements anticipated from Glaslyn Cables and the relatively small overlap in study areas.

Construction Noise and Vibration

4.3.7 Where a potential combined effect from traffic on construction routes has been identified there is also the potential for combined effects as a result of construction traffic noise. However it is considered unlikely that these would be of greater significance than the Proposed Development alone.

Socio Economics

4.3.8 Due to the geographical separation of the Proposed Development and much of the Wider Works, there are few shared receptors. Assessments of the Wider Works have concluded that there are no significant effects on any socio-economic receptors except possibly tourism business receptors in the Glaslyn Estuary area; however, there is no overlap between tourism businesses in the Glaslyn Estuary area and those potentially affected by the Proposed Development. Therefore, the Wider Works would not increase the significance of effects reported for the Proposed Development alone.

4.3.9 The reconductoring of the 4ZC route could potentially affect the community of Pentir. However, there would be no increase in the significance of effects reported for the Proposed Development alone.

Agriculture

4.3.10 There would be the potential for both temporary and permanent combined effects on agricultural land use as a result of the Proposed Development and the Wider Works, however as the potential permanent BMV loss (land take) would not exceed 20 ha and would also be considered at a regional

level, the overall level of significance reported for the Proposed Development alone would not change.

There would be the potential for both temporary and permanent combined effects on agricultural soils and AES as a result of the Proposed Development and the Wider Works, however due to the geographical separation of the Wider Works to the Proposed Development, there would be no combined effects to soils, drainage and AES.

Intra-Project Combine Effects

4.3.11 As the assessment of combined effects has not identified any effects which would increase the reported level of significance for the Proposed Development. The Intra-Project Effects remain as reported in Chapter 19 – Intra-Project Effects (**Document 5.19**).

5 References

Ref 21.1: The Planning Act 2008. Available at: http://infrastructure.independent.gov.uk/wp-content/uploads/2009/08/ukpga_20080029_en.pdf

Ref 21.2: Town and Country Planning Act 1990 (as amended). Available at: http://www.legislation.gov.uk/ukpga/1990/8/contents

Ref 21.3: Electricity Act 1989. Available at: http://www.legislation.gov.uk/ukpga/1989/29/contents

Ref 21.4: North Wales Connection Project Scoping Report. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN020015/EN020015-000093-Scoping%20Report%20and%20Appendices.pdf

Ref 21.5: North Wales Connection Project Preliminary Environmental Information Report (PEIR). Available at: http://northwalesconnection.com/current-documents-and-maps.aspx