

APPENDIX 8A Evaluation of Broad Route Options

8A.0 BROAD ROUTE OPTIONS

- 8A.1 Following the process outlined in Chapter 5.0 Route Selection Process, broad route options have been identified which connect Legacy and Oswestry substations. These are: Option 1 to the east of the A483(T)/A5; Option 2 to the west of the A483(T)/A5; Option 3 following the main north south road corridor; and Option 4 paralleling the existing 132kV overhead line. These broad route options are shown on Figure 8.1.
- 8A.2 Information gained during initial consultation, collation of the baseline information and through initial site visits was used to carry out a preliminary assessment of these options. This information was used to identify potential routes or key constraints to routeing within these broad corridors.
- 8A.3 Only strategic level environmental constraints and effects on people were considered at this stage.

Strategic Environmental Considerations

- 8A.4 Holford Rule 1 is of relevance here, which recommends avoidance altogether, if possible, of the major areas of highest amenity value. This is interpreted as extensive areas that have been designated for their landscape, cultural, nature conservation or recreational value at the international or national level. Of these, the study area includes examples of the following:
- Special Area of Conservation (European designation)
 - Sites of Special Scientific Interest (SSSI)(national designation)
 - Scheduled Monuments (national designation)
 - Listed Buildings
 - Conservation Areas
 - Historic Gardens and Designed Landscapes (national, non-statutory registers)
 - National Trails (recreational routes)
 - National Trust Estates open to the public
 - Ancient Semi-Natural Woodland
- 8A.5 There are none of the following potential strategic constraints within the study area:
- Ramsar sites (international designation)
 - Special Protection Areas (European designation)
 - National Parks (national designation)
 - Areas of Outstanding Natural Beauty (national designation)
 - National Nature Reserves (national designation)
 - World Heritage Sites
- 8A.6 The nomination of Pontcysyllte Aqueduct & Canal to become a World Heritage Site was officially approved in June 2007 and submitted to UNESCO by the UK in January 2008. The Site and its Buffer Zone were not initially considered in the routeing study (undertaken in 2006), but as this is considered to be a strategic constraint to routeing, the assessment has been revisited and updated accordingly.
- 8A.7 There are no landscape designations of national importance or above within the area. The areas of highest amenity value in terms of landscape, in the context of this study, are those designated at local planning authority level. Such designation was not considered a strategic constraint to routeing but was given a high priority below the strategic constraints identified. Approximately one third of the study area has a local landscape designation.

8A.8 In order to minimise the effects upon landscape character routeing through blocks of woodland should be avoided if at all possible. Thus woodlands were identified as a strategic constraint to routeing.

8A.9 The following paragraphs summarise the main designation sites constraining strategic routeing.

Special Areas of Conservation

8A.10 There are three SACs within the study area:

- River Dee and Bala Lake
- Johnstown Newt Sites
- Berwyn and South Clwyd Mountains.

8A.11 The River Dee SAC applies to the watercourses only of the Dee and Ceiriog rivers. It is not possible to avoid crossing this SAC at least once in achieving a route between Legacy and Oswestry. Route options west of the confluence of the Dee and Ceiriog (east of Chirk) will cross both the Dee and Ceiriog.

8A.12 Johnstown Newt Sites is a group of relatively small sites adjoining the eastern edge of the settlement of Rhosllanerchrugog and Johnstown. Although existing high voltage distribution lines cross the designated site, this SAC is likely to constrain route selection eastwards from Legacy

8A.13 Berwyn and South Clwyd Mountains SAC covers an extensive area in the north west of the study area, approximately 2-3 km west of Legacy substation.

Sites of Special Scientific Interest

8A.14 The study area contains eight SSSIs, only one of which, Ruabon & Llantysilio Mountain & Minera, is considered of sufficient extent to form a constraint to corridor routeing. This site is located within the Berwyn and South Clywd Mountains SAC, at the extreme northwest of the study area. The geographical location of all SSSIs was mapped in order to see if clusters or concentrations occurred which would form a constraint to routeing.

Ancient Semi-Natural Woodland

8A.15 The extent of Ancient Semi-Natural Woodland within the study area is limited, and comprises several very small woodlands or parts of woodland. All woodland has been regarded as a strategic constraint to routeing, although it was recognised that some woodlands are likely to be affected due to their widespread occurrence throughout the study area. Areas of Semi-Natural Woodland were mapped as these would be avoided where possible if it was inevitable that woodlands would be affected by a route.

World Heritage Site Nomination

8A.16 The Pontcysyllte Aqueduct and Canal Site, together with its Buffer Zone, is located to the west of the study area. It extends from west of the study area, at Horseshoe Falls on the River Dee, along the Llangollen Canal to the A483 road corridor in the vicinity of Chirk in the east. Option 2, west of the A483/A5(T) corridor, would therefore require a crossing of the Nominated Site and its Buffer Zone.

Scheduled Monuments

- 8A.17 The majority of Scheduled Monuments within the study area are of insufficient geographical extent to be considered at the strategic routeing stage. However Offa's Dyke, which runs broadly north south in the western part of the study area, is marked by a series of scheduled monument designations, as is Wat's Dyke, which follows a similar alignment east of Offa's Dyke. Frequent crossing or paralleling of these routes could have an impact upon their overall setting, and these were thus considered strategic constraints to routeing.

Listed Buildings

- 8A.18 Like most Scheduled Monuments, listed buildings can be worked around in finding the precise route, and are not addressed until the detailed routeing stage.

Historic Gardens and Designed Landscapes

- 8A.19 There are eleven Registered Historic Parks and Gardens within the study area, situated predominantly within a central band across the study area, in the vicinity of the Dee and Ceiriog valleys. Although some of the smaller estates could be avoided through deviation, overall such a designation was considered a strategic constraint to routeing.

National Trust Estates

- 8A.20 Estates owned by the National Trust and open to the public, Erddig and Chirk Castle, were considered strategic constraints. Such estates are valued for both their cultural and recreational aspects, and are important tourist attractions.

Offa's Dyke Path National Trail

- 8A.21 This national recreational route is located in the extreme west of the study area, only in part following the alignment of the ancient defensive earthwork.

Local Landscape Designations

- 8A.22 The entire western part of the study area, from the edge of the main settlements westwards, is designated, either as an Area of Outstanding Beauty (Denbighshire CC), Area of Special Landscape Character (Oswestry BC) or Special Landscape Area (Wrexham CBC). This designation encompasses the area around Legacy substation.
- 8A.23 The Dee and Ceiriog valleys, together with adjacent slopes, side valleys and historic parkland areas are largely protected by local landscape designations - Special Landscape Area (Wrexham CBC) and Area of Special Environmental Interest (North Shropshire BC). It is not possible to route between Legacy and Oswestry (within the study area) without crossing through this designation (or routeing through a main area of settlement), and so for this aspect, consideration was focussed upon minimising the distance through the designated area.
- 8A.24 In the northern part of the study area further smaller Special Landscape Areas (Wrexham CBC) are found around Erddig and other parkland estates.

Effects on People

- 8A.25 Supplementary Note A to the Holford rules states 'Avoid routeing close to residential areas as far as possible on grounds of general amenity'. This is applied at the strategic level as it influences broad-scale routeing decisions.
- 8A.26 The study area is bounded by the large settlements of Wrexham and Oswestry to the north and south respectively. The primary constraint to routeing however is the almost continuous band of built development extending south from Wrexham to the Dee valley. This comprises the settlements of Rhostyllen, Rhosllanerchrugog, Johnstown, Ruabon and Cefn-Mawr. To the east of the study area there are few settlements larger than villages, with the exception of St Martin's.

Route comparisons

- 8A.27 The following sections describe the characteristics of areas identified as broad route options, to identify potential constraints and opportunities, and summarise the conclusions about each one.

Option 1 - East of the A483(T)/A5

- 8A.28 This option covers the eastern half of the study area to the east of the A483(T)/A5. The area primarily comprises gently undulating pastoral agricultural land supporting scattered farms and dwellings with the larger village settlements of St Martin's, Rhewl, Gobowen and Whittington to the south of the rivers Dee and Ceiriog. The Dee and Ceiriog valleys run in an east-west direction through the centre of this area and form distinctive landscape features, which are designated as a Special Landscape Area (SLA). The area immediately surrounding Legacy substation also falls within a SLA.
- 8A.29 Being predominantly rural in land use, there are fewer settlement areas and main communication corridors which otherwise present challenges for choosing a route option. This is evident by the presence of existing high voltage overhead lines to the west of the route option area.
- 8A.30 The areas to the north and south of the Dee valley are characterised by hedgerows and hedgerow trees, which, combined with gently rolling topography and small incised valleys containing linear woodlands, create a largely enclosed landscape character with few distant views. The area's landscape character is also strongly influenced by the occurrence of several large parkland estates, including Erddig, Wynnstay, Brynkinalt, Pen-y-lan, Rosehill, Erbistock, Henlle, Great Fernhill and Halston Hall.
- 8A.31 Woodland is largely confined to the Dee and Ceiriog valleys, although the presence of mature trees and hedgerows throughout gives the whole area a fairly wooded appearance. The Dee and Ceiriog valleys are designated as a Special Area of Conservation (SAC), and there are several smaller pockets of land designated for their ecological value to the north in the vicinity of Legacy substation.
- 8A.32 Wat's Dyke runs through the eastern part of the study area and is an important archaeological feature. Tourist attractions within the area include Erddig Park, a National Trust owned property to the north, and the Shropshire Union Canal which runs through the southern half of the study area.

Key Environmental Factors

- 8A.33 The main constraints within this predominantly rural area are considered to be the several registered historic parklands and extensive areas of woodland, mostly associated with the Dee and Ceiriog valleys. These constraints form an almost continuous band from east to west across the study area.
- 8A.34 Generally the undulating nature of the topography combined with mature hedgerows and trees affords the landscape a relatively high capacity to accommodate a wood pole overhead line. There are several potential route options which avoid the main areas of constraint.

Option 2 - West of the A483(T)/A5

- 8A.35 This option covers the western half of the study area to the west of the A483(T)/A5. The northern half of this area is densely populated with the settlements of Rhosllanerchrugog, Penrycae, Ruabon, Plas Madoc, Acrefair, Cefn Mawr and Trevor forming an almost continuous band of built development between the River Dee and Legacy substation. The settlement of Chirk occupies the area of land between the Rivers Dee and Ceiriog and Western Rhyn lies to the south of the Ceiriog. To the east of these settlements there are also areas of Registered Parkland associated with the Wynnstay and Brynkinalt estates.
- 8A.36 The remaining area to the west comprises smaller village settlements and isolated farms and dwellings. West of Legacy, the topography rises steadily to Ruabon and Esclusham Mountains (circa 500m AOD). The landscape becomes notably more rural in nature with the higher ground comprising open heather moorland. The intervening border hill slopes are characterised by small irregular fields, hedgerows with mature hedgerow trees, and scattered farms and small settlements (Wrexham Landmap Character Area 5B Eastern Slopes of Ruabon Mountain). The higher ground to the west is designated as SLA, which extends over a significant area of upland landscape occupying much of the area within Option 2.
- 8A.37 The Dee and Ceiriog rivers form distinct steep sided landscape features within the area, with the valley sides supporting dense woodland vegetation. The aqueducts, viaducts and road bridges associated with these valleys form important cultural heritage features within the landscape. The World Heritage Nomination Site, Pontcysyllte Aqueduct and Canal, and its associated Buffer Zone, forms a continuous band across the centre of this area, of at least 1 kilometre width.
- 8A.38 Chirk Castle occupies an area of higher ground to the west of Chirk overlooking the Ceiriog valley and is owned by the National Trust.
- 8A.39 The land to the south of the study area in the vicinity of Oswestry is rural in character and comprises gently undulating pastoral land bounded by mature hedgerows with mature hedgerow trees. The landscape becomes more parkland in character to the west of Oswestry in the vicinity of Brogyntyn, which is a Registered Historic Park and Garden.
- 8A.40 Oswestry Hill Fort Scheduled Monument lies to the south of the study area approximately 0.5km to the north west of Oswestry substation and it forms a prominent embanked feature in the landscape. Wat's Dyke runs in a north easterly direction from the Fort.

- 8A.41 Offa's Dyke runs through the northern half of the study area passing through Chirk Castle grounds before running in a north easterly direction crossing the River Dee to the east of Cefn Mawr. It then runs through Wynnstay Park and through Ruabon and Rhosllanerchrugog before heading north to the east of Legacy substation.
- 8A.42 The Dee and Ceiriog valleys are designated as a SAC, as are the Berwyn Mountains to the west, and there are several smaller pockets of land designated for ecological importance to the north in the vicinity of Legacy substation, including the mosaic of sites which make up Johnstown Newt Sites SAC.

Key Environmental Factors

- 8A.43 The key environmental issues affecting the routeing of an overhead line are primarily located in the northern half of the study area, with fewer constraints to the south within the borough of Oswestry. To the north, the combination of large areas of settlement adjacent to areas designated for their landscape value limit potential route options, as both factors are likely to result in a route option having a greater overall visual impact (in comparison to a sparsely settled landscape with no landscape designation).
- 8A.44 Dense built development stretches to the south of the substation at Legacy from Rhosllanerchrugog to Cefn Mawr and there are very few gaps which could be utilised as potential overhead line routes. The few gaps that are present between parts of the built development are largely associated with sites of mineral activity, areas of ecological importance or are associated with historic parkland. Breaks in the development are also utilised as routes for existing overhead lines. The continuous development in this area is considered to pose a constraint on route options available.
- 8A.45 The continuous built development would necessitate potential route options taking a more westerly alignment, along the eastern slopes of Ruabon Mountain, an area of pastoral farmland between 180m and 350m AOD rising from edges of urban villages to the edge of Ruabon Moors. The higher ground is designated as an area of Special Landscape Value. Potential routes within this area are considered likely to give rise to increased visual impact.
- 8A.46 The Dee and Ceiriog Rivers occupy steep valleys within this area and are heavily wooded with no natural crossing points. This is considered to be a constraint to routeing.
- 8A.47 Pontcysyllte Aqueduct and Canal World Heritage Nomination Site is located along the Dee valley, extending south to the Ceiriog valley at Chirk. Any route to the west of the A483 road corridor would need to cross this site, considered to be a major constraint to routeing.
- 8A.48 To the south of the River Ceiriog there are fewer constraints to overhead line routeing and the area offers several potential routes. Oswestry Hill Fort and Brogyntyn historic parkland are located in the vicinity of the substation and would have to be carefully considered in detailed routeing options.
- 8A.49 The presence of a number of high-level constraints, notably to the north, limits potential routes within this western option. That is not to say that there is no potential, however other broad route options offered more potential. This broad route option was not studied in any further detail at this stage.

Option 3 - Following the Main Road Corridor

- 8A.50 This option follows the main road which runs between Wrexham and Oswestry and forms the most accessible direct route between the substations. The main road comprises the A5 from Oswestry to Halton, where it then runs in a westerly direction towards Llangollen, and the A483(T) which continues from Halton towards Wrexham and beyond.
- 8A.51 The road comprises stretches of single carriageway, dual carriageway and some sections of three lane carriageway with varying priority for the overtaking lane. It is a fast national speed limit road and there are six junctions onto it located between Wrexham and Oswestry. The road is predominantly level with surrounding land or on embankment allowing views out over the surrounding area.
- 8A.52 This stretch of road includes two high road bridges (viaducts) over the River Dee and the River Ceiriog which run in deep valleys. From these crossing points there are impressive views out along the wooded valleys.
- 8A.53 To the north of the study area there is a significant amount of development, notably to the west of the road. This includes the urban areas of Rhosllanerchrugog and Ruabon. Developed areas immediately abut the road in places, and in the case of Ruabon development abuts the road corridor on both sides.
- 8A.54 The land surrounding Erddig Hall is under the ownership of the National Trust and lies to the immediate east of the A483(T) for approximately 1km to the north of the study area. Further south the A483(T) runs through two other Registered Historic Parklands, the Wynnstay Estate (for over 2km) and the Brynkinalt Estate (for approximately 1.5km).
- 8A.55 There are several areas of new development or development allocations in the vicinity of the junction leading into Chirk. To the west of the settlements of Gobowen and Rhoswielf development lies in close proximity to the road. The remaining land along the road is predominantly in agricultural use, especially to the south of the study area where there is less built development.
- 8A.56 Oswestry Hill Fort is located 0.5km to the west of the A5 in the vicinity of Oswestry substation and is a prominent landmark when viewed from the road.

Key Environmental Factors

- 8A.57 The key issues affecting the routing of an overhead line along the existing road are primarily located to the northern half of the study area where there are substantial areas of land supporting existing built development.
- 8A.58 In the central part of the study area the key constraints are the areas of historic parkland associated with the Wynnstay and Brynkinalt Estates and the steep river valleys.
- 8A.59 There are fewer constraints to the south adjacent the A5, however the settlements of Gobowen and Rhoswielf form a restriction on routing.
- 8A.60 The A483(T)/A5 is a main road through the border area between England and Wales and as such is a well-used tourist route, notably for travelling to destinations such as Llangollen and other border market towns. The road is also well used by local people and there are several

settlements and dwellings located in close proximity to the road. A route which follows the alignment of the existing road is likely to affect the visual amenity of a greater number of people than options routed through land of a more rural nature.

- 8A.61 A technical issue related to routeing along the road corridor relates to the road crossings of the river valleys. It is not possible to mount poles along the viaduct safely, both in terms of structural integrity of the viaduct and the overhead line support and in relation to maintaining electrical clearances. It would be necessary to use cables within the road carriageway or mounted in some way on the viaduct. Consultation during the routeing process with the local authority responsible for the viaducts (at that time, Conwy County Borough Council) demonstrated that this was not feasible and a diversion away from the road corridor would be necessary for crossing the river valleys. Any diversion around the viaducts would require crossing of steep sided, wooded valleys with no natural crossing points.
- 8A.62 The constraints identified in relation to routeing a line along the existing road corridor were considered to be such that other options offer increased potential. This option was not therefore considered further at this stage.

Option 4 Paralleling the Existing 132kv Overhead Line

- 8A.63 This option follows the line of the existing 132kV double circuit lattice tower line which runs between Legacy and Oswestry substations.
- 8A.64 Although the Holford Rules and other guidance express caution regarding running lines closely together, the geographical area affected by the overhead lines is minimised in comparison to separate routes, where a larger geographical area would be affected. When routes run in parallel, sufficient distance should be maintained between the lines to ensure that, should one of the lines suffer disruption or failure, it would not also affect the adjacent line. The 'falling distance' of the taller of the support structure is generally the height of the tower/pole plus 3.4 metres (safety clearance requirement for 132kV line). In this situation, the taller structures will be the existing 132kV support towers (with a typical height of 26.5m). This translates to a need to maintain at least 30 metres between lines.
- 8A.65 The Holford Rules observe that converging overhead line routes can lead to a concatenation 'wirescape', although this observation is made in relation to country which is '*flat and sparsely planted*' whereas this landscape is typically gently rolling with good hedgerow cover with trees. However, the existing 132kV lattice line already runs in close parallel with the NGC owned Ironbridge No.2 400kV line between Legacy and the River Dee crossing point. A further addition to these parallel overhead lines may lead to an increased cumulative impact. This may be compounded by introduction of a third type of support, and different interval between supports (the typical spans between 132kV lattice steel towers are greater than between wood pole supports; and the intervals between the larger 400kV lattice steel towers are greater still).
- 8A.66 Initial assessment of existing pole mounted lines in the local area indicated that they are able to be well assimilated into the undulating landscape which is characteristic of this area. The local undulations combined with mature hedgerows and hedgerow trees do not generally enable views of the wood pole supports beyond a field or two in distance. Routeing a new wood pole line in parallel with an existing lattice tower line is considered likely to increase the attention focused towards both existing and proposed overhead lines, whereas routed in isolation the new line would be less intrusive in the landscape.

Key Environmental Factors

- 8A.67 Between Legacy and the A483(T) the existing 132kV lattice steel tower overhead line occupies a corridor in close proximity to the large settlements of Rhosllanerchrugog and Johnstown, in places entering within the urban fabric. Avoidance of proximity to residential areas (Supplementary Note A to the Holford Rules) is considered a strategic constraint to routeing.
- 8A.68 The existing route crosses Johnstown Newt Sites SAC. It also crosses the drive of the registered parkland of Wynnstay, and extends for over one kilometre within the Essential Setting of this estate. In addition to crossing the locally designated landscape of the Dee valley, the existing line follows an alignment on the eastern bank of the Ceiriog valley, resulting in over 5km length within a SLA designation.
- 8A.69 In addition, the cumulative effect which would result from paralleling is considered to be a constraint to routeing. On this basis, a paralleling option was not considered to be a favoured option and was not considered in any further detail at this stage.

Summary of Broad Route Options

- 8A.70 A summary of the options considered is shown on Table 8.1. The key environmental issues relating to each option are identified. Each environmental factor is of varying weight and the determination of a preferred option is a judgement based on a combination of the factors and levels of constraint. However Table 8.1 provides a concise summary of the key issues which were considered.
- 8A.71 In summary, Option 1 would utilize a gently rolling landscape with opportunities to use the numerous woodlands to integrate and assimilate the wood pole line. Additionally, few settlements are likely to be affected. Option 2 comprises a large proportion of dense urban development, which borders rising land with an open aspect, making any potential route likely to be visible to numerous receptors. A significant proportion of the more open, higher land is designated as a Special Landscape Area. Option 3, utilising the road corridor, has not proved technically possible in certain key locations. Option 4, installing an additional route parallel to existing high voltage overhead lines, is constrained by the cumulative visual effects of paralleling, together with proximity of existing lines to settlement and sites designated for their nature conservation value or historic landscape value.

Identification of Preferred Broad Route Option

- 8A.72 The preliminary assessment of broad route options, as described above and as summarised in Table 8.1, indicated a strong preference for the identification of potential routes within Option 1 – East of the A483(T)/A5. This is followed in terms of preference by Option 4, which, although it contains a number of overhead lines already, similarly occupies a rolling landscape where there are plenty of wooded areas to screen the new line.
- 8A.73 A more detailed route selection and evaluation process has been undertaken in the area to the east of the A483(T)/A5. This is described in the following Chapter.

