Chapter 3
The Routeing Process and Design Strategy

Introduction

3.1 This chapter outlines SPEN's approach to routeing, the routeing objective, the routeing methodology for the New 132kV OHL and the outcomes of the routeing and consultation process.

3.2 Following a review of the relevant policy context, the remainder of this chapter discusses the design strategy for the New 132kV OHL, access tracks and forestry felling, the design of which, in combination with the routeing work previously undertaken, played a critical role in seeking to avoid and reduce, likely significant environmental effects. An overview is also provided for the proposed infrastructure design along the Existing 132kV OHL to facilitate its decommissioning, as well as any modifications that were made to avoid and reduce possible significant environmental effects.

SPEN's Approach to Routeing

3.3 The UK Government, Ofgem and the electricity industry, including SPEN, have reviewed their positions on the routeing of major electrical infrastructure projects including overhead lines (OHLs). They remain of the view that the need to balance economic, technical and environmental factors, as a result of statutory duties and licence obligations, continues to support an OHL approach in most cases. It is therefore SPEN's view that wherever practical, an OHL approach is taken when planning and designing new or replacement transmission lines. However, SPEN accepts that there are specific circumstances in which an undergrounding approach should be considered.

3.4 In 2015, SPEN published a summary document outlining the approach taken to routeing transmission infrastructure (Major Infrastructure Projects: Approach to Routeing and Environmental Impact Assessment, SPEN 2015[1]). The routeing of the New 132kV OHL has been undertaken in accordance with SPENs overarching approach to routeing document.

Overview of the Routeing Consultation Process

3.5 SPEN is committed to consulting with key stakeholders, including statutory and non-statutory consultees and the local community. The consultation and engagement process begins at the early stages of the development of a project and continues into construction once consent has been granted.

3.6 SPEN's approach to stakeholder engagement for major electrical infrastructure projects is outlined in **Chapter 5** of the document **'Major Infrastructure Projects: Approach to Routeing and Environmental Impact Assessment'**. SPEN aims to ensure effective, inclusive and meaningful engagement with local communities, statutory consultees, stakeholders and interested parties through four key engagement stages:

1. pre-project notification and engagement;
2. information gathering to inform the routeing stage;
3. obtaining feedback on emerging route options; and
4. the Environmental Impact Assessment (EIA) stage.

3.7 In addition, as outlined in **Chapter 1**, SPEN as holder of a transmission licence, has a duty under section 38 and Schedule 9 of, the Electricity Act 1989, when putting forward proposals for new electric lines and other transmission development, to have regard to the effect of the proposals on communities, in addition to the desirability of preserving amenity, the natural environment, cultural heritage, landscape and visual quality.

3.8 As highlighted in **Chapter 2**, SPEN previously undertook two routeing exercises and rounds of public consultation in relation to the replacement of the Erskine to Devol Moor OHL in 2007 and 2010. These consultations were based on routeing a new double circuit steel tower line. However, due to changing requirements in the transmission network, SPEN have since undertaken further analysis of its proposals against future requirements of the network in the area.

3.9 Following on from this, a new routeing exercise was undertaken by SPEN in 2018 to identify and appraise route options for the New 132kV OHL. A Routeing and Consultation Report (2018) was prepared setting out the methodology adopted for the routeing of the new (wood pole) 132kV OHL, the routeing objective, the routeing strategy and the outcome of the appraisal of route options culminating in the 'preferred route'. The Routeing and Consultation Document was consulted upon and comments sought from statutory and non-statutory consultees and the public.

3.10 Details of the routeing process adopted and the findings, as set out in the Routeing and Consultation Report, are summarised below.

The Routeing Objective

3.11 Section 38 and Schedule 9 of the Electricity Act 1989 impose a statutory duty on SPEN to take account of the following factors in formulating proposals for the installation of transmission lines and other works:

> *"(a) 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,*
>
> *(b) to do what it reasonably can to mitigate any effects which the proposals would have on the natural beauty of the countryside or any such flora, fauna, features, sites, buildings or objects."*

3.12 SPEN has a 'Schedule 9 Statement' which sets out how it will meet the duty placed upon it under section 38 and Schedule 9. As a result of the above, SPEN is required to formulate proposals that meet the technical requirements of the electricity system, which are economically viable, and cause, on balance, the least disturbance to the environment and the people who live, work and enjoy recreation within it.

3.13 In developing and maintaining an efficient and co-ordinated technically and economically viable transmission system, in accordance with its statutory duties and transmission licence obligations, SPEN is committed to limiting disturbance to people and the environment by its operations. It is widely acknowledged that the best way to achieve this is through careful routeing. The exercise of professional judgement is required in weighing a range of issues to ultimately identify routes, which, on balance, best meet the project routeing objective.

3.14 As discussed in the Routeing and Consultation Report[i], the Routeing Objective for the New 132kV OHL was:

> *"To identify a technically feasible and economically viable replacement route for a continuous 132kV OHL connection supported on wood poles from Erskine to Devol Moor. The route should, on balance, cause the least disturbance to the environment and the people, who live, work and enjoy outdoor recreation within it."*

The Routeing Methodology

3.15 It is generally accepted across the electricity industry that the guidelines developed by the late Lord Holford in 1959 for routeing overhead transmission lines, 'The Holford Rules'[ii], with subsequent updates, should continue to be employed as the methodological basis for routeing high voltage overhead transmission lines. Whilst the Holford Rules relate specifically to steel tower lines, in the case of wood poles, many similarities exist with routeing of tower lines and therefore many of the principles contained in the Holford Rules have also been used as a guide to routeing the New 132kV OHL supported on wood poles.

3.16 Key principles of the Holford Rules include avoiding prominent ridges and skylines, following broad wooded valleys, avoiding settlements and residential properties and maximising opportunities for 'backclothing' and the screening[2] of infrastructure.

[1] This document is reviewed every 3-5 years.

[2] It is acknowledged that in relation to the provision of woodland screening (with reference to commercial woodland in particular) screening is often only of a temporary nature.

3.17 SPEN's approach to routeing the New 132kV OHL was to adopt a 'blank sheet' approach which did not solely reflect the route of the Existing 132kV OHL. This approach ensured that all potential route options were identified and appraised equally.

3.18 The routeing strategy adopted for the New 132kV OHL was the following:

"Route options will seek to avoid high ground and ridgelines, responding to the grain of the landscape, subject to avoiding areas of highest amenity value as far as possible. In more densely populated areas and where there are other competing environmental and/or technical constraints, the weighting and balancing of these constraints will be given careful consideration."

3.19 Where, due to the requirement to balance a number of technical and environmental factors, the OHL is routed through forestry, the Forestry Commission's[3] Landscape Design Guidelines, which contain guidance in relation to routeing OHLs in areas of forestry, have been followed. The guidelines advise "*a power line through the forest should*":

- *avoid areas of landscape sensitivity;*
- *not follow the line of sight of important views;*
- *be kept in valleys and depressions;*
- *not divide a hill in two similar parts where it crosses over a summit;*
- *cross skylines or ridges where they dip to a low point;*
- *follow alignments diagonal to the contour as far as possible; and*
- *vary in the alignment to reflect the landform by rising in hollows and descending on ridges".*

3.20 The routeing methodology for the New 132kV OHL was also informed by the following:

- SPEN and LUC experience of routeing OHLs;
- consultation with stakeholders; and
- relevant national and local planning policy and guidance.

3.21 The methodology for line routeing comprises a number of broadly sequential steps as shown in **Figure 3.1** below**.** For simplicity, the methodology is set out in a linear manner, with the findings of each step informing the next step, building up an ever increasing level of understanding to inform the routeing process. However, it is important that the process for identification of routes remains iterative. This means that the outcome of each step is subject to a technical and, where relevant, consultation 'check' to ensure that LUC, SPEN and key stakeholders are confident with the findings prior to commencing the next step.

Figure 3.1: Routeing Methodology

3.22 A number of overarching principles which informed the routeing methodology for the New 132kV OHL are outlined below.

Technical Considerations

3.23 Technical issues considered in routeing were identified by SPEN. These included physical constraints to routeing such as existing high and low voltage OHLs within the area including the Existing 132kV OHL, as well as the existing 400kV OHL which exits Devol Moor substation. Slope, altitude, access, large waterbodies and the location of committed developments, including existing or proposed wind farms and single turbine developments, were also taken into account.

3.24 Additional technical issues, including wood pole design (single or double 'H' poles), construction techniques, operational life and maintenance, and government guidelines were considered during the more detailed design stages as discussed further in the 'Detailed Design Alignment' section below and **Chapter 4: Project Description.**

Economic Considerations

3.25 In compliance with the duties within section 9 of the 1989 Act, the Routeing Objective required the 'proposed route' to be 'economically viable'. This is interpreted by SPEN as meaning that as far as is reasonably possible, and other things being equal, the line should be as direct as possible and the route should avoid areas where technical difficulty or compensatory requirements would render the scheme unviable on economic grounds.

[3] Scottish Forestry (SF), the successor to the Forestry Commission in Scotland in terms of policy, was established as an executive agency of the Scottish Government on 1 April 2019

Environmental Considerations

3.26 Statutory duties imposed by the Electricity Act 1989 require licence holders to seek to preserve features of natural and cultural heritage interest and mitigate, where possible, any effects which their development may have on such features. The construction and operation of the New 132kV OHL will potentially have effects on the environment and the people who live, work and recreate within it, including effects on the following:

- Visual amenity;
- Landscape character;
- Ecology and ornithology;
- Hydrology, geology and water resources;
- Cultural heritage;
- Land uses including agriculture and forestry;
- Residential amenity; and
- Recreation and tourism.

3.27 Some environmental effects can be avoided or reduced through careful routeing whilst other effects are best mitigated through local deviations of the route, the refining of wood pole locations and specific construction practices. The '**Detailed Design Considerations'** section of **Chapters 6-11** indicate, for each specialist topic area, those factors that were taken into consideration in the routeing and design process.

The Routeing Process and Identification of 'Preferred Route' for the New 132kV OHL

3.28 The first step in the routeing process (Step A) involved identification of the study area, predominantly for the purposes of gathering data specific to the project area. In identifying the study area, it was important to ensure that this was large enough to accommodate all likely route options reflecting the Routeing Objective and Routeing Strategy. On this basis, the study area was required to be able to accommodate a continuous 132kV OHL from the existing Erskine substation to the existing Devol Moor substation.

3.29 A preliminary check was also carried out to identify the presence of International, European or nationally designated areas within or immediately adjacent to, the study area, to ensure that potential effects on these areas could be considered. Taking account of the above, and also informed by topography, the maximum area (study area) across which the route options were likely to be located, was identified.

3.30 The next step (Step B) was to identify and map the 'areas of highest amenity value' within the study area to further focus the study area, reflecting guidelines included in the Holford Rules. These included the following national level designations and features:

- Sites of Special Scientific Interest (SSSIs): SSSIs are defined in the Wildlife and Countryside Act 1981 (as amended) as areas of land or water which are of special interest by reason of their flora, fauna or geological or physiographical features;
- Scheduled Monuments: Scheduled Monuments are monuments of national importance, given legal protection under the Ancient Monuments and Archaeological Areas Act 1979;
- Inventory Gardens and Designed Landscapes (GDLs): GDLs which are particularly important for their scenic quality and historic interest are identified in the Inventory of Gardens and Designed Landscapes in Scotland and are highlighted for their national importance within the Scottish Historic Environment Policy (SHEP)[4];
- Conservation Areas (CAs): Conservation Areas are protected under the Listed Buildings and Conservation Areas (Scotland) Act 1997[5];
- Unscheduled Archaeology of National Importance;
- Listed Buildings: Listed Buildings are also protected under the Listed Buildings and Conservation Areas (Scotland) Act 1997; and
- Settlements: Identified as towns or villages identified in the Local Development Plans[6] (LDP).

3.31 'Regional or local high amenity value' designations were also identified to be avoided where possible. These included:

- Non-Inventory Gardens and Designed Landscapes;
- Regional Scenic Areas/ Local Landscape Designations;
- Regional Parks; and
- Local Nature Conservation Sites (LNCS): a 'catch-all' term used to define various local nature conservation sites designated by local authorities. In most cases, these are designated as they represent a viable example of a habitat or species of conservation interest at a local level.

3.32 A 150m 'trigger for consideration' was mapped around each residential property to allow this proximity to be balanced with other considerations, while also helping identify possible 'pinch points'.

3.33 The nature of the topography and the technical and environmental constraints in the study area between Erskine and Devol Moor substations informed the identification of 'route option sections' as opposed to geographically distinct 'route options' (Step C). The sections combined in numerous different ways to provide alternative route options between the two project end points (i.e. the substations) and it was considered that appraisal of all possible combinations would be an unnecessarily complex and lengthy process. As such each 'route option section' was appraised against its equivalent (e.g. Section 1a against Section 1b), and the most appropriate section taken forward to form part of the overall route option.

3.34 In total, four route option sections, within which thirteen route options were identified and appraised (Step D). These are shown on **Figure 3.2**.

3.35 The appraisal objective was to identify a 'preferred route' for each of the four sections of the project, in a comparable, documented and transparent way to identify the overall 'preferred route'.

3.36 The route options, within each of the four sections, were appraised using the following criteria[7], which continued to reflect the key considerations of the routeing methodology:

- length of route;
- biodiversity and geological conservation;
- landscape and visual amenity (including recreation and tourism);
- cultural heritage;
- land use;
- forestry; and
- flood risk.

3.37 An emerging 'preferred' route was identified which was considered on balance to cause the least disturbance to the environment and the people, who live, work and enjoy outdoor recreation within it, and best reflects the Routeing Strategy. The emerging 'preferred' route was reviewed by SPEN in relation to the system/network design requirements and also the existing OHL network (in relation to required clearance distances and the crossing of the existing network). This review was undertaken to ensure that, based on the level of detail available, the 'preferred' route was within the technical parameters required to construct OHLs. Following this technical confirmation of the 'preferred' route, an environmental review was undertaken of the 'preferred' route option sections in combination with each other to form the entire New 132kV OHL. The objective of this was to ensure that in combination, the emerging 'preferred' route continued to meet the Routeing Objective and SPEN's statutory duties.

[4] GDLs which are particularly important for their scenic quality and historic interest are identified in the Inventory of Gardens and Designed Landscapes in Scotland and are highlighted for their national importance within the Scottish Historic Environment Policy (SHEP).
[5] Conservation Areas are also included as areas of highest amenity value as, although a local level designation, these correspond generally with population centres and are listed in the SHETL notes accompanying Holford Rule 1 as an example of areas of highest environmental value.
[6] Considered within areas of highest environmental value due to their inherent association with population centres.
[7] See Appendix 2 of the Erskine to Devol Moor 132kV Replacement Project: Routeing and Consultation Report (February 2018).

3.38 The 'preferred route' has been re-produced in **Figure 3.2**. This route was taken forward to consultation in February and March 2018 (see **Chapter 2: Approach to the EIA**).

Identification of the 'Proposed Route'

3.39 Feedback received from statutory and non-statutory consultees, the public and landowners during the routeing consultation exercise was taken account of by SPEN, and modifications to the 'preferred route' were made culminating in the 'proposed' route. SPEN were of the opinion that the proposed route taken forward to the detailed alignment stage best met the Routeing Objective for the New 132kV OHL and SPEN's wider statutory duties. This decision was communicated to key stakeholders, communities and individuals who engaged with SPEN during the consultation period in a Consultation Feedback report[iii]. The 'proposed route' was progressed to the EIA Scoping[8] stage and detailed design alignment.

The Design Strategy - Policy Context

3.40 In line with The Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013 (as amended)[iv], Part 3, Regulation 13, an application for planning permission for developments belonging to the categories of national developments or major developments require to be accompanied by a design statement explaining the principles and concepts which have been applied to the design. Although the New 132kV OHL is not a development to which the regulations apply, SPEN recognise the value in explaining the design principles and concepts which have been applied to the proposals. Scottish Planning Policy (SPP) (2014)[v] also highlights the importance of design as a material consideration in the determination of planning applications with design statements considered a valuable tool in guiding the quality of developments and the promotion of positive change. Development design and well-designed places is highlighted as a key consideration in the vision for the planning system in Scotland as set out in the SPP.

3.41 Planning Advice Note (PAN) 68 Design Statements (2003) aims to see design statements used more effectively in the planning process to create places of lasting quality. Importantly, whilst PAN 68 is concerned mainly with urban design and the architectural quality of buildings as opposed to utility infrastructure, it does state that even where a formal design statement is not necessary, applicants should still have a clear and logical design philosophy which could be explained if required.

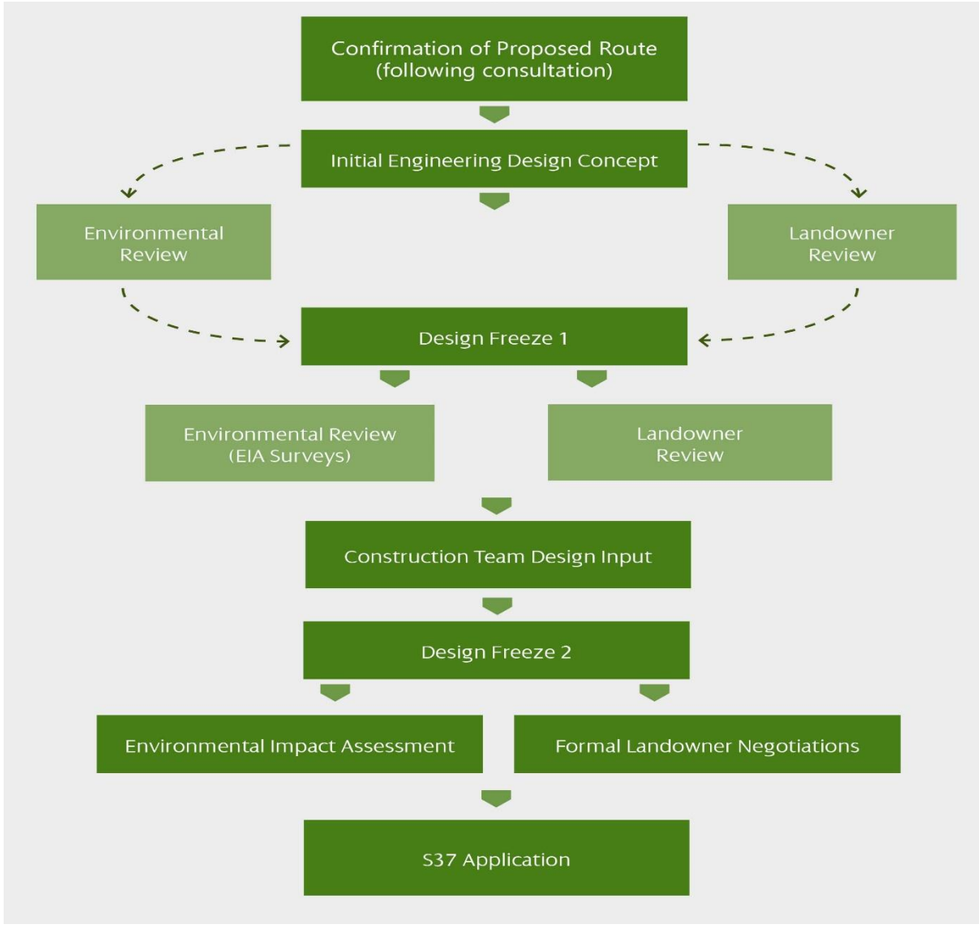
3.42 PAN68 highlights the need for the programme for delivery of the project to be considered in designing the project. The programme for construction of the New 132kV OHL is 13 months with subsequent decommissioning of the Existing 132kV OHL taking 12 months. Further details of the construction and decommissioning phases are provided in **Chapter 4.**

Detailed Design Alignment

3.43 Following the identification of a 'proposed route', work was progressed to identify the most appropriate alignment for the New 132kV OHL. This design process was led by the SPEN OHL design team informed by the emerging findings of the environmental surveys, comments from consultees via the scoping process and, importantly, landowner feedback.

The process adopted for designing and assessing the final route alignment is outlined in **Figure 3.3** below.

Figure 3.3: Detailed Design and Assessment Process



Project Design Parameters

3.44 It is important to highlight the following project parameters which influenced the design of the New 132kV OHL from the outset:

- The purpose of the New 132kV OHL is to replace the existing 132kV steel tower transmission line between Erskine substation and Devol Moor substation, to ensure security of supply;
- The required voltage and capacity was an important design parameter in influencing the selection of the support type (the steel towers are being replaced with a single circuit 'Trident' wood pole design operating at 132kV);
- under section 38 and Schedule 9 of the Electricity Act 1989 ('the Act'), SPEN is required to consider technical, economic and environmental issues in undertaking its duties, for which design plays an important role. As a consequence of the above, design and routeing objectives for the New 132kV OHL required technical, economic and environmental issues to be balanced; and

[8] The 'proposed route' is presented in the Erskine to Devol Moor 132kV Replacement Project EIA Scoping Report (December 2018).

- the design strategy reflects well established procedures and guidance (the Holford Rules[vi]) and incorporates poles and associated infrastructure used widely across the UK electricity transmission network.

3.45 In line with established practice, the design of the following was considered in sequence; informed by technical considerations, including the required transmission capacity:

1. the pole locations, type, and span length;
2. the location and design of access tracks and working areas; and
3. the design of forestry felling and re-planting.

3.46 These elements are discussed below.

The Design Team

3.47 The design work was led by SPEN's in-house engineering design team, informed by the findings of an environmental constraints mapping exercise undertaken by the project environmental specialist teams.

3.48 In consultation with SPEN and LUC, the forestry design work was undertaken by RTS Ltd, who are experienced forest management specialists. Consultation has also been undertaken with landowners to inform the siting of poles and other infrastructure.

Wood Pole Design

3.49 The key design objective for selection of the wood poles has been to meet technical requirements, including capacity, safety, network security requirements, and OHL design parameters, whilst taking account of economic and environmental considerations.

3.50 On this basis, SPEN selected a 132kV Trident wood pole design because it has a low profile and is not as intrusive as steel towers on the landscape. Pole locations can also be relatively flexible and the construction requirements of timber structures would also be potentially less disruptive to the landscape and habitats found along the route.

3.51 Single and double (also known as 'H') poles are proposed to be used for the New 132kV OHL. There are three types of pole proposed:

- *Line* or *suspension* poles where the pole is part of a straight section of line and no change in direction is required. Straight sections of wood pole lines include *section* poles where segmentation is required to contain any failure of the OHL;
- *Angle* or *tension* poles where there is a horizontal or vertical deviation in the line direction and straight sections of line require to be segmented. Angle poles can accommodate changes in direction of up to 75 degrees; and
- *Terminal* pole where the OHL ends before entry into a substation.

3.52 Proposed span lengths between single Trident wood poles across the route range between approximately 38m and 115m with an average span of 93m. The standard height of poles above ground is 15m, although the height of Poles 57 and 58 will be 19.15m and 16.76m respectively to facilitate the safe crossing of the railway.

3.53 Further details of the poles, including construction details, diagrammatic illustrations and photographs are provided in **Chapter 4: Project Description**.

3.54 Wood poles are dark brown when first erected and weather to a silver/grey after about five years, a colour in between these is the colour on which routeing and impact has been assessed. The wood pole top cross-arms are galvanised steel and support the aluminium conductors on stacks of grey insulator discs. Both the steelwork and aluminium will weather and darken after a few years.

Access Track Design

3.55 Access to wood pole locations and working areas is proposed during the construction of the New 132kV OHL. The overall design objective for the access tracks has been to avoid and/or reduce effects upon natural and cultural heritage interests and to cause least disturbance to current land use and land management practices. The principle method employed to achieve this has been to maximise the use of existing tracks (and bridges). Where this is not possible, or where the use of existing tracks would result in unnecessarily long connecting tracks, two options for temporary access tracks have been considered as follows:

- the use of temporary spurs from existing roads/tracks to each pole; and
- the use of temporary tracks between poles which connect to an existing road or track.

3.56 Further details of the proposed tracks are provided in **Chapter 4**, including the temporary track options available for different ground conditions, and the proposals for reinstatement once the tracks are removed.

Forest Felling and Re-Planting Design

3.57 The overall design objective has been to minimise the extent of felling required and woodland areas and individual trees were avoided where possible during the routeing phase. Where routeing through woodland has been unavoidable, a 'wayleave' corridor is required for safety reasons to ensure that trees do not fall onto the line and for health and safety of forestry operatives. SPEN has statutory powers to control tree clearance within the wayleave corridor. For the New 132kV OHL, a corridor of 70m (i.e. 35m either side of the centre line) is required. Where possible the design of the New 132kV OHL and associated infrastructure has sought to avoid/minimise felling where possible, when balancing with other technical and environmental objectives, and 'crowning' of individual mature trees is proposed where this can be accommodated to avoid felling the tree.

The Design Stages

3.58 An initial engineering concept design comprising angle poles only was designed by SPEN's OHL design team to reflect technical parameters which aimed to:

- minimise the number of poles required;
- maximise the span lengths between poles;
- minimise the number of angle poles; and
- minimise the number of crossings of the M8 motorway, railway line and existing OHLs, including the existing 132kV OHL to be replaced.

3.59 The initial engineering design of the New 132kV OHL was subsequently subjected to a review by the environmental specialist teams, informed by environmental information gathered during the desk and field surveys as well as feedback from consultees. This further environmental information and its application to the alignment stage included:

- **Landscape and visual**: informed by consultation responses and landowner feedback, further field work was undertaken to establish the existing baseline conditions, from publicly accessible and private land (where access was granted) to identify potential landscape receptors, and key views and visual receptors (people). The alignment of the OHL was reviewed in relation to landscape and visual sensitivities, and potential landscape and visual effects, to determine the most appropriate alignment, as well as the location and height of individual poles (subject to technical limitations of the OHL design e.g. topography). The landscape and visual review considered key views from residential properties and popular recreational assets (e.g. Cora Campus), views from within the Formakin Inventory Garden and Designed Landscape (IGDL), key transitory routes (e.g. the crossing of the M8 and railway line north of High Hatton as well as the A8) and how the alignment of the OHL is integrated alongside existing landscape features (e.g. forestry and other existing OHLs) and in relation to underlying landform and topography.
- **Forestry**: desk based and field surveys were undertaken supplemented by consultation with Scottish Forestry (then Forestry Commission Scotland) to assess existing woodland conditions and review proposals for long term management of woodland blocks. This information was used to inform the alignment of the OHL, to seek to minimise felling of broadleaf woodland, mature conifers (where not scheduled for felling imminently to avoid/minimise windthrow) and utilise existing forest edges where possible.
- **Geology, Hydrology, Hydrogeology, Water Resources and Peat**: a walkover hydrological survey was carried out to identify and document watercourses, identify other water features such as wetlands and springs, ground-truth private water supply (PWS) data within 250m of the route, undertake an overview assessment of areas identified as floodplain within the SEPA Flood Maps and provide a general overview of landscape and land cover of importance to hydrology. These findings resulted in a number of design modifications to the alignment of the OHL, with a 20m 'buffer' being placed around all watercourses, and all poles being located outwith this buffer wherever possible. In addition, consideration was given to PWS catchments and areas of marsh land. Peat probing was undertaken where peat was anticipated (based on the review of British Geological Survey Superficial Geology maps, Soils Scotland Mapping and SHN Carbon and Peatland Mapping), to identify the spatial coverage and depth of peat along the 'proposed route'. Poles were designed to avoid areas of relatively deep peat where possible.
- **Biodiversity (ecology and ornithology)**: the initial biodiversity field surveys comprised an extended Phase 1 Habitat Survey including an assessment of suitable habitat for any protected species e.g. otter, water vole, great crested newt, bats (roosting

potential within adjacent woodland and/or buildings) and badger, as well as a search for field signs of such species. The findings of the extended Phase 1 habitat survey and protected species surveys informed the alignment of the OHL where appropriate. Desk studies, consultations to date, and a programme of targeted ornithological field surveys commenced in April 2018 and were completed in April 2019 during the detailed alignment stage. These included surveys for populations where individuals breed, roost or forage at distances of up to 5km from the New 132kV OHL.

- **Cultural Heritage**: a desk-based assessment and walkover field survey was conducted to identify all known cultural heritage assets within 200m of the 'proposed route' as well as visits to key cultural heritage assets which have potential intervisibility with the New 132kV OHL within the wider study area (3km wide), to assess whether the presence of the New 132kV OHL would affect their settings. A visit was also made to the Whitemoss Roman Fort Scheduled Monument to assess the potential effects of the decommissioning of the Existing 132kV OHL on its setting.

3.60 Where possible, SPEN wayleaves team also contacted landowners to discuss the initial design and gather their feedback. Where pole positions were considered to have a potentially adverse effect on the environment, or an adverse effect on land holdings, a new position was suggested by the SPEN wayleaves team and passed to the environmental specialists for comment. This feedback was then provided to the SPEN OHL design team for further consideration and accommodation where possible, (without compromising the technical design requirements).

3.61 At this stage, SPEN's design team issued Design Freeze 1.0 which included all wood pole locations and indicative working areas and access tracks. This design was subject to review by the environmental specialist teams, and consultation with landowners.

3.62 Modifications to Design Freeze 1.0 were recommended by environmental specialists and landowners primarily to:

- Increase distances from residential properties, particularly where direct views of the OHL would be experienced including at High Hatton and Richieston, and move individual pole locations from direct line of sight of properties, including North Porton;
- Relocate the OHL onto lower ground to reduce visual extent;
- Relocate wood poles and construction working areas outside Dargavel Burn SSSI (at least 50m), watercourse buffers (at least 20m) and PWS catchments (where possible[9]);
- Modify alignment to avoid loss of mature trees within the wayleave, particularly along the B789 and 'Chestnut Avenue';
- Relocate alignment to north of Parkglen Wood to avoid Ancient Woodland; and
- Address landowner concerns, particularly the potential loss of agricultural land.

3.63 Suggested modifications to Design Freeze 1.0 highlighted a need for 'top up' hydrology surveys (private water supplies, peat and watercourses) and ecology surveys (habitats and protected species) to identify any previously unknown constraints to be avoided by the 'proposed route' alignment (see **Chapters 7** and **8**). In addition, further tree surveys were undertaken along the Design Freeze 1.0 alignment to identify the condition, height and age of certain mature trees. This was to identify where the route alignment may need to be further modified to avoid the felling of mature trees, or where it may be possible to route closer to trees than the standard wayleave (70m) to address other technical and environmental constraints, whilst still maintaining operational safety of the OHL.

3.64 The above modifications resulted in Design Freeze 2.0 which also comprised all working areas, construction compounds and access tracks along the New 132kV OHL and Existing 132kV OHL routes following the detailed SPEN construction team input and review.

3.65 Informed by landowner consultation, the top-up hydrology and ecology surveys and in particular the additional forestry walkover, modifications to Design Freeze 2.0 were made primarily to:

- Avoid loss of mature oak, ash and lime trees and loss of young native broadleaf woodland;
- Minimise loss of chestnut trees along Chestnut Avenue and minimising the wayleave as far as possible in this area without adversely affecting operational safety of the OHL;
- Removal of poles and accesses from PWS catchments e.g. at Barbeg;
- Avoid direct line of site from residential properties e.g. Drums;
- Avoid steep ridge south of Glen Craig by moving alignment south;
- Use recently created/existing access tracks where feasible;
- Continuing to avoid Dargavel Burn SSSI with wood poles and associated infrastructure;
- Re-routeing of access tracks for existing tower removal within Dargavel Burn SSSI to minimise crossing of the SSSI; and
- Moving the alignment to keep to fences and field boundaries wherever possible in order to minimise land take.

3.66 On the basis of the emerging findings of the EIA, where possible adverse environmental effects associated with the New 132kV OHL were identified, the EIA was used to further influence the design, without compromising the overall routeing objective. Modifications included the following:

- the relocation of individual poles and working areas;
- the relocation and/or re-orientation of working areas and pulling areas to account for hydrological constraints in particular;
- modification of areas of felling for the wayleave; and
- the use of existing access tracks and hardstanding areas as construction compounds i.e. at Erskine substation.

Detailed Alignment Outcome and EIA

3.67 SPEN is of the opinion that the final design of the New 132kV OHL best meets the strategic Routeing Objective and SPEN's wider statutory duties, and this is shown in **Figures 4.1a-h**.

Decommissioning of Existing 132kV OHL

3.68 As the existing steel towers are already in-situ, the design of the access tracks and working areas has primarily been influenced by the tower locations and the technical requirements to access these locations whilst seeking to avoid or minimise effects on the existing environmental conditions, as identified through desk and field surveys. Two key locations where sensitive environmental conditions have influenced the design of temporary infrastructure required for decommissioning of the Existing 132kV OHL, and/or require location specific decommissioning mitigation are the Dargavel Burn SSSI and Whitemoss Roman Fort Scheduled Monument.

3.69 Where possible, feedback from the environmental specialists on the location of the decommissioning infrastructure has been taken into consideration, and modifications made such as the re-orientation of working areas around towers, access track type and route and watercourse crossings.

3.70 The final location of infrastructure on the Existing 132kV OHL route is shown in **Figures 4.1a-h**, and further detail in relation to specific measures to protect sensitive features during decommissioning are presented in **Chapter 4**.

Consideration of Alternatives

3.71 Schedule 4 Part 2 of the EIA Regulations states that an EIA Report should include, *"A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects"*.

3.72 In the context of the requirements of the EIA Regulations and guidance, SPEN has considered the following reasonable alternatives to the final design of the New 132kV OHL, and these are discussed in further detail below.

Options for Connection

Alternative Routes

3.73 Alternative routes within the overarching study area were identified and appraised in the Routeing and Consultation Report (2018) against a number of environmental and technical considerations. The route that was identified as the 'preferred route', on the

[9] Where avoidance of private water supply catchments was not possible, further desk-based analysis and consultation with the owners of properties served by the private water supply was undertaken to understand the hydrological connectivity with construction works, and design amendments were made accordingly.

whole best satisfied the routeing objective and routeing strategy derived at the start of the routeing exercise, and was selected as the option to progress to consultation and subsequently, EIA scoping.

Use of Steel Towers

3.74 Whilst it is not considered a technical requirement to use steel towers for the New 132kV OHL, SPEN considered the use of steel towers to cross the railway on the basis of the uncertainty that a wood pole OHL would provide the necessary technical clearance distance between the OHL conductors and railway line conductors. However, SPEN is able to source a larger wood pole than is proposed across the rest of the OHL route which will enable the minimum clearance distance to be achieved.

Undergrounding

3.75 SPEN is obliged to comply with the requirements of the Electricity Act 1989 to develop and maintain an efficient, co-ordinated and economical system of electricity transmission. SPEN's approach seeks to find an OHL solution for all connections and only where there are exceptional constraints would underground cables be considered as a design alternative. Such constraints can be found in urban areas and in rural areas of the highest scenic and amenity value. Where an OHL solution is not achievable for technical reasons, SPEN look to an underground cable solution as an alternative. However, sections of underground cable identified for inclusion within a scheme, must balance the economic, technical and environmental considerations.

3.76 The main environmental advantage of underground cable when compared to OHL is often the reduction in effects on visual amenity and landscape character.

3.77 The main environmental disadvantages of underground cable when compared to OHL often relate to greater effects on habitats and natural heritage interests; unknown archaeology; drainage and land use for construction/development. The disadvantages often arise from the invasive nature of excavation of trenches to lay the cable, the extent of the area disturbed, the equipment required and the volume of materials involved.

3.78 In consideration of the above factors, including consideration of the EIA and the potential environmental effects of installing a new wood pole between the Erskine and Devol Moor substations, SPEN remain of the opinion that the proposed OHL solution and alignment meet with our project routeing objective.

3.79 This approach and its conclusion also reflect SPEN's overarching approach to routeing of major electrical infrastructure[vii].

Restringing of Existing 132kV OHL

3.80 At over 70 years old, this Existing 132kV OHL is coming to the end of its operational life, and requires to be replaced to ensure electricity supplies are maintained. As assets get older (including steel towers), the need for maintenance work becomes more critical and more difficult, and the exposure to unplanned outages (faults) increases. In the case of the EDM Project, replacement is therefore essential to provide secure, reliable supplies to existing and future customers. This replacement can be achieved by a wood pole 'Trident' 132kV OHL.

[i] The Erskine to Devol Moor 132kV Replacement Project: Routeing and Consultation Report (February 2018). https://www.spenergynetworks.co.uk/pages/erskine_devol_moor.aspx
[ii] NGC 1992, SHETL 2003
[iii] EDM Consultation Feedback Report (January 2019) can be found at https://www.spenergynetworks.co.uk/pages/erskine_devol_moor.aspx
[iv] The Town and Country Planning (Development Management Procedure) (Scotland) Regulations (2013), as amended.
[v] Scottish Planning Policy (SPP) (2014)
[vi] The Holford Rules for the Routeing of New High Voltage Overhead Transmission Lines (1959). Reviewed circa 1992 by the National Grid Company (NGC) plc (now National Grid Transmission (NGT)) as owner and operator of the electricity transmission network in England and Wales, with notes of clarification added to update the Rules. Both the Holford Rules (and NGC clarification notes) were reviewed subsequently by Scottish Hydro Electric Transmission Limited (SHETL) in 2003 to reflect Scottish circumstances. Whilst these relate to towers only, the principles are also useful in routeing high voltage wood pole lines.
[vii] SPEN Approach to Routeing Major Electrical Infrastructure Projects https://www.spenergynetworks.co.uk/userfiles/file/SPEN_Approach_to_Routeing_FINAL_20150527.pdf