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2. ROUTE SELECTION AND ALTERNATIVES

2.1 Introduction

2.1.1 The overall objective of the Proposed Development is to provide an electrical connection for the Wind Farm to the national electricity network. In accordance with Regulation 5(2)(d) and Schedule 4, paragraph 2 of the EIA Regulations, this Chapter outlines the reasonable alternatives studied by the Applicant, which are relevant to the Proposed Development and its specific characteristics. The Chapter also summarises the main reasons for the option chosen, including a comparison of the environmental effects.

2.2 Development Considerations

2.2.1 The Applicant has obligations under Section 9 of the Electricity Act 1989 to 'develop and maintain an efficient, co-ordinated and economical system of electricity transmission'.

2.2.2 The Applicant, as a licence holder under the Electricity Act 1989, 'when formulating proposals to generate, transmit, distribute or supply electricity', is required under Schedule 9 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
- "do what [it] reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects".

2.2.3 The Construction (Design and Management) Regulations 2015 (CDM Regulations) require that the design aims to minimise hazards and reduces risks during construction.

2.2.4 The Holford Rules provide guidance relating to the routeing of overhead electricity transmission lines.

2.2.5 Taking account of these obligations, the Applicant has considered technical, economic and environmental factors in evaluating the alternatives for the Proposed Development, with the objective of identifying a proposed alignment and associated Limit of Deviation (LOD) which is 'technically feasible and economically viable' and 'which causes the least disturbance to the environment and to the people who live, work, visit and recreate within it'.

2.3 Summary of Routeing Process

2.3.1 The approach to route selection was informed by the Applicant's guidance 'Procedures for Routeing of Overhead Lines of 132 kV or above' (March 2018). This Guidance broadens the basis for routeing decisions to reflect contemporary practice, and ensures environmental, technical and economic considerations are identified and appraised at each stage of the routeing process.

2.3.2 The guidance sets out the Applicant's approach to selecting a route for an OHL. This document helps the Applicant to meet its obligations under Schedule 9 of the Electricity Act 1989, as set out in Section 2.2 above.

2.3.3 The guidance splits a project into six stages, as follows:

- Pre-Routeing Activities: Selection of proposed connection option;
- Stage 0: Routeing strategy development;
- Stage 1: Corridor Selection;
- Stage 2: Route Selection;
- Stage 3: Alignment Selection; and
- Stage 4: EIA and consenting.

- 2.3.4 The Wind Farm's initial connection offer by the Applicant's system planning team provided the Cassley Grid Supply Point (GSP) as the point of connection to the network, located at OS Grid Reference 239640, 825340. A feasibility study undertaken as part of the Lairg to Cassley Reinforcement recommended the preferred connection point for the Wind Farm should be moved to the proposed Dalchork Substation (to be developed under the Lairg to Loch Buidhe 132 kV Reinforcement). This was due to concerns about the high potential for significant effects to the qualifying features of international, European and UK environmental designations (Ramsar / Special Protection Areas / Special Areas of Conservation / Sites of Special Scientific Interest), and protected landscapes (Wild Land).
- 2.3.5 An Options Assessment Report (OAR) undertaken by the Applicant also recommended the connection point for the Wind Farm should be the Dalchork Substation. As such the OAR defined the area of search (or preferred corridor) for an indicative proposed alignment between the Wind Farm's substation and the proposed Dalchork Substation.
- 2.3.6 Further to the selection of the corridor, four route options were identified (circa 1 km in width). These are shown on **Figure 2.1: Route Options** and discussed further in Section 2.4. A Route Options Appraisal was carried out in September 2017 which assessed the constraints to development of these four route options. A range of environmental topic areas were considered (see **Table 2-1**) in terms of the potential for the Proposed Development to be constrained and a Red, Amber, Green (RAG) rating applied as appropriate. This also considered technical constraints, as well as costs for each option. The approach applied a Green rating representing 'limited or no constraint' to development (and thus was the most preferred option), and a Red representing 'high potential' for development constraint (least preferred). This allowed for ease of comparison of the routes and identification of a preferred option.
- 2.3.7 This RAG rating assessment applied to each route option and considered the topic areas as outlined in **Table 2-1**.

Table 2-1: Route Options RAG Assessment Topics

Environmental Topic	Considerations
Natural Heritage	Designations; Protected species; Habitats; Ornithology; and Hydrology and geology.
Cultural Heritage	Designations; and Cultural heritage assets.
People	Proximity to dwellings.
Landscape and Visual	Designations; Landscape character; and Visual.
Land Use	Agriculture; Forestry; and Recreation.
Planning	Policy; and Proposals.

- 2.3.8 Comparison of the RAG assessment results between the route options considered allowed the opportunity to identify a preferred route.
- 2.3.9 Following identification of a proposed route, an Alignment Selection Study was carried out in March 2019 which assessed three alignment options within the proposed route, following a similar methodology to the Route Options Appraisal. The alignment options are shown on **Figure 2.3: Alignment Options** and discussed further in Section 2.4.

2.3.10 Throughout the routeing and alignment process, consultation with statutory and non-statutory consultees was carried out, and comments or views expressed were taken into account during development design. This is discussed further in Chapter 4 of this EIA Report.

2.4 Alternatives

2.4.1 The EIA Regulations require the Applicant to report upon reasonable alternatives that were studied and the main reasons for the choice of the Proposed Development, including a comparison of the environmental effects. Various alternatives have been considered during project development, including:

- the “Do Nothing” Scenario;
- alternative corridors, routes or alignments for the Proposed Development; and
- alternative technical options.

“Do-Nothing” Scenario

2.4.2 The “do-nothing” scenario assumes that no other options are considered and that no connection to the national electricity network is provided for the Wind Farm.

2.4.3 The “do nothing” scenario is not considered a feasible development option as it would fail to deliver the application for connection and be inconsistent with the Applicant’s licence obligations to develop and maintain an efficient, coordinated and economic electricity system, which on balance causes the least disturbance to the environment and to the people who live and work within it.

Alternative Corridors, Routes or Alignments

2.4.4 The routeing process, summarised in Section 2.3, described the identification of the corridor, route and alignment options. This Section elaborates on those route and alignment options considered, and the justification for the proposed alignment put forward.

2.4.5 As previously noted, four routes were considered within the study area. These were identified following site appraisals, taking into account the most notable constraints identified during baseline studies and the steps outlined in the Holford Rules and the Applicant’s routeing guidance. The corridor and the route options considered are displayed on **Figure 2.1: Route Options**. The routes are summarised below:

- Route 1: This route overlaps Route 2 until the Strath Tirry, at which point it deviates south-west to connect with the existing 132 kV OHL adjacent to the A838;
- Route 2: Routes 2, 3 and 4 overlap between the wind farm substation and north of Crask Inn. Route 2 (approximately 15 km in length) then separates from Option 3 south-west along River Tirry and re-joins north-east of Tirryside. This option follows the western edge of Dalchork Forest with an initial width of 1 km that was expanded so the eastern border of the route follows the A836 and National Route 1;
- Route 3: This route is approximately 20 km in length. The western border of the route follows the A836 and National Route 1. The route was initially 1 km wide and was expanded east to include the forestry haul road where no constraint restrictions were identified; and
- Route 4: This route, approximately 24 km in length, stays on the east of the A836 and follows the eastern edge of Dalchork Forest until Tighcreag. The route turns westward along the northern shore of Loch Tigh na Creige following the forest track to connect to the substation site.

2.4.6 A range of considerations were used to identify the optimal route option. These are summarised as follows:

- avoid, if possible, major areas of highest amenity value (including those covered by national and international designations and other sensitive landscapes);
- avoid, by deviation, smaller areas of high amenity value;
- try to avoid sharp changes of direction and reduce the number of larger angle towers required;

- avoid skylining the route in key views and, where necessary, cross ridges obliquely where a dip in the ridge provides an opportunity;
- target the route towards open valleys and wood where the apparent height of towers will be reduced, and views broken by trees (avoid slicing through landscape types and try to keep to edges and landscape transitions);
- consider the appearance of other lines in the landscape to avoid a dominating or confusing wirescape effect;
- technical issues related to clearances, connectivity, outages, maintenance and faults; and
- any other project specific requirements.

2.4.7 The results of the Environmental Route Options Appraisal determined Route Option 3 to be the environmentally preferred option.

2.4.8 Route Option 1 was discounted at an early stage due to technical constraints¹.

2.4.9 Route Option 2 had the least potential to accommodate infrastructure in respect of all considerations. Relatively greater impacts were likely as a result of this route upon designated ecological habitats along its full length. Greater levels of landscape and visual impacts were anticipated in comparison with options 3 and 4. Route Option 2 also had potential to impact areas of blanket bog within Section C (approximately the central portion of Dalchork Forest).

2.4.10 Route Option 4 had less potential to accommodate infrastructure due to its proximity to international heritage designations and cultural heritage features. Effects on natural heritage were likely to be greater in Section C in comparison with Route Option 3, and a Red rating was anticipated for designated ecological sites in Section D (Lairg and Strath Brora Lochs Special Protection Area (SPA) and Strath Carnaig and Strath Fleet Moors SPA).

2.4.11 While Route Option 3 was the preferred option, potential constraints in relation to diver species present at the site were relevant to all route options, as well as cultural heritage features within Section D, at the south end near Dalchork Substation. All route options sought to make best use of open space or existing linear features, such as the A836, to minimise potential requirements for felling of forestry. A summary of the rationale for selection of the preferred route is provided in the Route Selection Consultation Document which can be downloaded from the project website².

2.4.12 Stage 3: Alignment Selection followed an iterative process involving the Applicant (as client), OHL consultants (Energyline), and environmental consultants (Ramboll). Initially, Energyline developed an indicative OHL alignment within the Preferred Route between the two connection points from a technical perspective taking account of environmental constraints identified at the time.

2.4.13 Follow-up site-appraisals were then undertaken by Ramboll and Energyline to ground truth the indicative alignment. Alignment options were then identified following site appraisals, taking into account the most notable constraints identified during the baseline studies.

2.4.14 For ease of assessment and interpretation, the Study Area was divided into five sections from A to E as listed below:

- Section A: Creag Riabhach Wind Farm substation to River Tirry;
- Section B: River Tirry to North of Lub Ruadh Plantation;

¹ Option 1 would require the existing 132 kV OHL to be upgraded which would require prolonged temporary diesel generation for residents, penalties for loss of generation to existing hydro generation, and a new 132 kV switching station would be required to connect the proposed OHL to the existing 132 kV OHL.

² Creag Riabhach Windfarm 132 kV OHL Consultation Document – Routeing [online] Available at: <https://www.ssen-transmission.co.uk/projects/creag-riabhach-wind-farm-connection/> [Accessed 21 January 2020]

- Section C: North of Lub Ruadh Plantation to Abhainn Sgeamhaidh Burn;
- Section D: Abhainn Sgeamhaidh Burn to Central Sutherland Crater Walk; and
- Section E: Central Sutherland Crater Walk to Dalchork substation.

2.4.15 Each alignment option in each section was considered in terms of its potential interaction with environmental and engineering characteristics, features and sensitivities. These were compared to determine which alignment option had greatest and least capacity or potential to accommodate the Proposed Development.

2.4.16 Each option in each section was then assigned a RAG colour ranking reflecting its relative potential to accommodate infrastructure, in a similar manner to that of Stage 2. In assigning a RAG description, consideration was also given to the relative importance or sensitivity of the environmental or engineering feature in question.

2.4.17 Alignment Option 1 was identified as the Preferred Alignment from the appraisal exercise. At the north end, in Section A, Option 1 crossed shorter sections of blanket bog than Option 1a and avoided the Site of Special Scientific Interest (SSSI) and a landscape character of higher sensitivity (open moorland). In Section D, further south, in comparison with Option 1b, Option 1 had no designated assets within close proximity and was preferable from a forestry perspective, requiring less felling to accommodate a wayleave corridor.

2.4.18 In July 2018, the Applicant published a second consultation document on the alignment selection³, and also undertook a public exhibition in Lairg, as discussed in Chapter 4 of this EIA Report.

2.4.19 The alignment options considered are displayed on **Figure 2.3: Alignment Options**.

Further Refinement of the Preferred Alignment

2.4.20 Following consultation feedback from Scottish Natural Heritage (SNH) during the alignment selection stage, as discussed in Chapter 4 of this EIA Report, an amendment was made to the preferred alignment in order to avoid the risk of adversely affecting the integrity of the qualifying features of the Ben Klibreck Site of Special Scientific Interest (SSSI) situated north of Dalchork Forest and east of the A836. The alignment was subsequently revised to traverse west of the A836 and the Crask Inn to avoid the areas of concerns.

2.4.21 **Figure 2.4: EIA Scoping Alignment** presents the revised alignment, which was taken forward for EIA and presented as part of the EIA Scoping Report.

2.4.22 During the landscape and visual assessment undertaken as part of the EIA, concerns were raised regarding potentially significant adverse effects to receptors around the Crask posed by the alignment of the proposed OHL. The Applicant subsequently explored options to mitigate the landscape / visual concerns whilst being mindful to other concerns raised, such as those relating to natural heritage and cultural heritage. The options considered included:

- rerouting the OHL alignment; and
- exploring the option of an underground cable in the area of concern, connected to the OHL by a sealing end structure at each end.

2.4.23 Due to the concerns raised by SNH regarding natural heritage, and the presence of very deep peat where construction of a woodpole would not be possible, the option to reroute the OHL was not considered feasible. As such, the Applicant undertook technical assessments on the underground cable option, taking account of environmental constraints such as landscape / visual receptors, cultural heritage, and natural heritage. To mitigate against flood risk and prevent pollution of the watercourse, the Applicant proposes crossing beneath

³ Consultation Document: Creag Riabhach Grid Connection [online] Available at: <https://www.ssen-transmission.co.uk/projects/creag-riabhach-wind-farm-connection/> [Accessed 21 January 2020]

the bed of the River Tirry with a horizontal directional drill. Details of this drilling process are included in Chapter 3 of this EIA Report.

- 2.4.24 Throughout the alignment selection stage and EIA, consultation has been undertaken with Forestry and Land Scotland (FLS) in their capacity as a landowner to minimise the effects of the Proposed Development on their interests. Following internal consultation within FLS during the EIA stage of the Proposed Development, concerns were raised regarding areas of former plantation that had been restored to peatland, which were funded through the SNH peatland action fund.
- 2.4.25 Through detailed consultation with FLS, amendments to the alignment were proposed to minimise the effects of the Proposed Development on areas of peatland restoration, whilst being mindful of areas being retained for commercial conifer production. To better understand the issues raised, the Applicant undertook detailed environmental and engineering assessments on the amendments. In brief: mapped areas of current and future peatland restoration were used as a basis to derive an alternative alignment which minimised the length of OHL passing through them. Areas of existing open ground or edges of forestry blocks were followed to also minimise the requirement for woodland removal, although felling requirements increased slightly overall. This resulted in the alignment proposed during EIA scoping to be amended.
- 2.4.26 Further details are presented in Chapter 4 of this EIA Report.
- 2.4.27 **Figure 2.5:** Alignments Comparison and Forestry and Land Constraints presents a comparison of the OHL alignment shown in the EIA Scoping, dated March 2019, and the amended OHL alignment to avoid or minimise potential effects to areas where former plantation has been restored to peatland.
- 2.4.28 The proposed alignment, for which Section 37 consent is sought, is presented on **Figure 3.1**.

Alternative Technical Options

- 2.4.29 Two options for the connection were considered by the Applicant, as follows:
- single wood pole trident structure; and
 - double wood pole trident structure.
- 2.4.30 The single wood pole design option was discounted as it could not carry the weight of the selected conductor and soft ground conditions create potential stability issues. As a result, the Applicant selected a 132 kV OHL wood pole trident structure as the proposed solution.
- 2.4.31 A steel lattice tower was not considered as a wood pole option was sufficient to meet the capacity requirements for the connection, and can be delivered at significantly lower cost, thus meeting the Applicant's license obligations.
- 2.4.32 An underground cable option for the whole route was not considered due to a combination of cost and operational resilience factors. Underground cables are significantly more expensive to install compared to an OHL solution. In addition, the Applicant has an operational preference for an OHL solution due to the ease and speed of fault finding and maintenance.