

VOLUME 1: CHAPTER 2: THE ROUTEING PROCESS AND ALTERNATIVES

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Appendices (Volume 4 of this EIA Report)

There are no appendices associated with this Chapter.

2. THE ROUTEING PROCESS AND ALTERNATIVES

2.1 Introduction

- 2.1.1 This Chapter describes the routeing process and consideration of alternatives undertaken for the Proposed Development. These processes have enabled the consideration of reasonable alternatives of relevance to the Proposed Development, in accordance with Regulation 5(2)(d) and Schedule 4, paragraph 2 of the EIA Regulations.
- 2.1.2 Consideration of alternatives has been undertaken for the Proposed Development in response to the needs case, as set out in **Chapter 1 (Section 1.2: Project Need)** and has comprised both: (i) the alternative types of technology solution considered to address that need; and (ii) the routeing process for the selected technology solution (being overhead line (OHL)), to establish a proposed route¹ and alignment² determined to provide an optimum balance of environmental, technical (engineering feasibility) and economic factors. The routeing process has followed SSEN Transmission's Guidance³, providing a systematic framework for the identification and appraisal of alternatives for OHL projects.
- 2.1.3 The process included a programme of consultation at both routeing and alignment stages, designed to engage with key stakeholders, including statutory and non-statutory consultees, local communities and landowners. This has enabled feedback on the rationale for, and approach to, the selection of the proposed route, alignment and technology solution of the Proposed Development.
- 2.1.4 Further review of the Proposed Development during the EIA stage of the project has also led to further refinement of the design, to minimise potential environmental effects, where practicable.
- 2.1.5 The initial sections of this Chapter (**Sections 2.2 and 2.3**) outline the relevant statutory framework and the strategic alternatives considered by the Applicant in defining the nature of the Proposed Development and its technology, in response to the needs case identified. The principal stages which were subsequently followed in the development of the new OHL transmission infrastructure for the Proposed Development are described in this Chapter, along with their respective outcomes. These include:
- The approach to the corridor, routeing and alignment selection stages of the Proposed Development (**Sections 2.4-2.5**);
 - The corridor selection stage process (**Section 2.6**);
 - The route selection stage process and consultation responses (**Section 2.7-2.10**);
 - The alignment selection stage process and consultation responses (**Section 2.11-2.13**); and
 - Further consideration of alternatives during the EIA process (**Section 2.14**).

2.2 Statutory and Licence Framework

- 2.2.1 SSEN Transmission as a transmission licence holder, has a statutory duty under section 9(2) of the 1989 Act to 'develop and maintain an efficient, co-ordinated and economical system of electricity transmission'.
- 2.2.2 Under Schedule 9 of the 1989 Act, 'when formulating proposals to generate, transmit, distribute or supply electricity', SSEN Transmission are required 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*

¹ A linear area of approximately 1 km width (although this may be narrower/wider in specific locations in response to identified constraints), which provides a continuous connection between defined connection points.

² A centre line of an overhead line or UGC.

³ SSEN Transmission (2020). Procedures for Routeing Overhead Lines and Underground Cables of 132 kV and above, Revision 2.0.

- “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 Furthermore, the Construction (Design and Management) Regulations 2015⁴ (CDM Regulations) require that the project design aims to minimise hazards and reduces risks during construction, operation and maintenance of assets.

2.2.4 Taking account of these obligations, SSEN Transmission has considered environmental, technical and economic factors in evaluating the reasonable alternatives for the Proposed Development, with the objective of identifying a proposed alignment and design solution 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 Design Solution

2.3.1 When considering technology options to provide a connection for the consented Glendye Wind Farm, there was an initial strategic choice to make between the use of UGC or OHL technology. The initial key distinguishing factor of these two technology types was their relative cost, with the most cost-effective solution to develop an efficient, co-ordinated and economical system of electricity transmission considered to be an OHL connection.

2.3.2 However, in addition to the cost of undergrounding, there are further technical, engineering, operational and environmental challenges associated with an UGC, which further contributed to the general design preference for a continuous OHL. These considerations are also discussed further below.

Economic Considerations

2.3.3 The cost of investing in the electricity transmission network is paid for by electricity consumers. As previously noted, Section 9(2) of the 1989 Act places a duty on the Applicant to develop and maintain an efficient, coordinated and economical system of electricity transmission.

2.3.4 A number of relevant policy and cost analysis studies have been undertaken that highlight the cost effectiveness of OHL infrastructure compared to UGC over an equivalent distance (see also **Section 2.14**).

2.3.5 In 2012, the Institute of Engineering and Technology (IET) published a study titled 'Electricity Transmission Costing Study: An Independent Report Endorsed by the Institution of Engineering & Technology', authored by Parsons Brinkerhoff⁵. The report concluded that an UGC has a build cost rate of 6.9-17.2 times greater than OHL, with a lifetime cost of 4.9-10.5 times greater (for further detail please refer to the cost comparison charts and tables in Section 8 of the Parsons Brinckerhoff Report⁵). The Parsons Brinckerhoff IET Report was a general (rather than project-specific) study and does not seek to establish a cost ratio that can be applied to all projects (see page vii). Nonetheless, the purpose of the report was to assist in determining the acceptability of a project in planning terms based on an accredited view of the relative costs.

Challenges of Undergrounding

Technical, Operational and Environmental Considerations of UGC

2.3.6 A key benefit of the use of UGC is that it can reduce landscape and visual impacts in certain circumstances by removing the need for OHL infrastructure. In an agricultural setting, UGC can, once installed, allow the ground to be farmed provided the UGC is able to be installed at a depth below that at which the field is ploughed. This

⁴ UK Government (2015), Construction (Design and Management) Regulations 2015, Online, Available at: <http://www.legislation.gov.uk/uksi/2015/51/contents/made> (last accessed 08/10/2025)

⁵ Institute of Engineering and Technology (IET) Electricity Transmission Costing Study - An Independent Report (2012) , report by Parsons Brinkerhoff

can allow farmers to utilise the full area of their fields, whilst for OHL technology, agricultural activities may be locally affected by tower or pole locations.

2.3.7 The challenges of using UGC at 132 kV, which informed the preferred technology type and approach to consultation with stakeholders, are as follows:

- During the construction period, a working corridor of between 30m and 40 m wide would be required for cable installation to accommodate access tracks, working and storage areas. UGC construction requires a continuous access along the entire length of the UGC cable section;
- The specialised equipment for UGC construction and weight of cable drums can require more substantial access infrastructure to accommodate heavier and larger equipment, compared to the requirements of OHL construction. An additional impact is the requirement for cable joint bays. UGC can only be transported in certain lengths ranging from 500 m – 1000 m and therefore cable joints are required at these intervals. These are generally below ground concrete structures where the cable joints are located. A single above ground link pillar is required within 10 m of each joint bay, which would be protected by stock proof fence. In addition, the joint bays require permanent access for operation and maintenance purposes. These elements are not required for OHL construction;
- Through areas of woodland, a corridor is required to be cleared of trees and other vegetation for installation and operational purposes, which is the case for both OHLs and UGCs. To ensure root growth does not damage UGCs, opportunities for tree retention in design, construction, and operation are limited;
- Peat and carbon-rich soils present a significant challenge to underground cabling. The Scottish Government's National Planning Framework 4 (NPF4⁶) clearly sets out that development proposals should seek to avoid or minimise impacts to peatland, carbon-rich soils and priority peatland habitat. Where the development of essential infrastructure will affect peatland, NPF4 clearly sets out that it would only be considered where there is a specific locational need and where it can be clearly demonstrated that no other alternative options are available to avoid excavating peat. The construction corridor associated with an UGC would result in a much larger area of habitat disturbance than in comparison to an OHL, and as a result would generate more excavated peat, with potentially greater risk of peat failures. Furthermore, the hydrological effect of UGC works in wetland and peatland areas (typical of those seen across the western extents of the Proposed Development where habitats support expansive areas of blanket bog with depths of peat ranging from 0.5 m to over 3 m deep) are generally considered greater than for OHL construction methods. In particular, the more granular and free draining backfill materials and sand required for much of the cable trenches installed for UGC's can effectively act as a subsurface drain, resulting in disruption to hydrological flow paths, drainage of water, and resulting in longer term disruption/degradation to surrounding habitats. These drying effects can be further exacerbated by the heat that is radiated out from UGCs. The larger, continuous and partially excavated working corridor required for UGC construction also increases the risk of pollution events and watercourse contamination; with an increased requirement for watercourse crossings and/or drilling under water courses to install cables (although best practice construction and appropriate mitigation measures can be implemented to minimise and mitigate effects. This is also relevant in the context of this project given the hydrological connectivity to the River Dee Special Area of Conservation (SAC) in the western extent of the Proposed Development.
- Excavations involved with underground trenches have a higher likelihood to disrupt shallow groundwater systems, which can result in the lowering of groundwater levels in the immediate vicinity of the excavations. In contrast, OHLs are unlikely to alter groundwater flows. Cable trenches can also

⁶ Scottish Government (2023) National Planning Framework 4: Explanatory report. (online) Available at: <https://www.gov.scot/publications/national-planning-framework-4/> [last accessed 08/10/2025]

modify water drainage pathways to groundwater flows, with potential impacts on environmentally sensitive wetland habitats such as marshes, flushes; and heightened risk to groundwater fed Private Water Supplies (PWS).

- It is notably more challenging to find a suitable route and install UGC on undulating terrain and steep slopes such as those associated with upland areas. Where there is rock near to the surface this can require significant rock breaking activities. This can permanently alter the landscape setting removing the natural appearance and creating hard edges where a cable trench is positioned.
- Restoring power in the event of an UGC fault can take significantly longer than for an OHL. UGC faults often require extensive works, specialist resource, tools and equipment to locate the fault, followed by significant civils work to expose the damage, replace the damaged section and carry out the repairs. This presents significant risks to security of supply and network reliability. On the 132 kV circuit required for the Proposed Development, this would prevent the wind farm from generating and exporting to the national grid. It also impacts on SSEN Transmission's ability to meet its licence obligations of maintaining an efficient transmission network. Prolonged outages would potentially impact on SSEN Transmission's network availability requirements required by the Office of Gas and Electricity Markets (OFGEM) and the National Energy System Operator (NESO).
- The installation of UGC can often require crossing of infrastructure such as public roads or railways. These cannot always be excavated in the same manner as other areas therefore Horizontal Directional Drilling (HDD) is often used. The use of this method leaves the cable section within the drill section inaccessible for repair and maintenance due to the installation method "sealing" behind it. In the specific areas where HDD installation is deployed it also results in the cable operating closer to cable ratings due to the depth at which it is installed. This can reduce the operational life of the cable.
- UGC can present risks of environmental pollution to watercourses due to cable surround material being washed out during flood events.

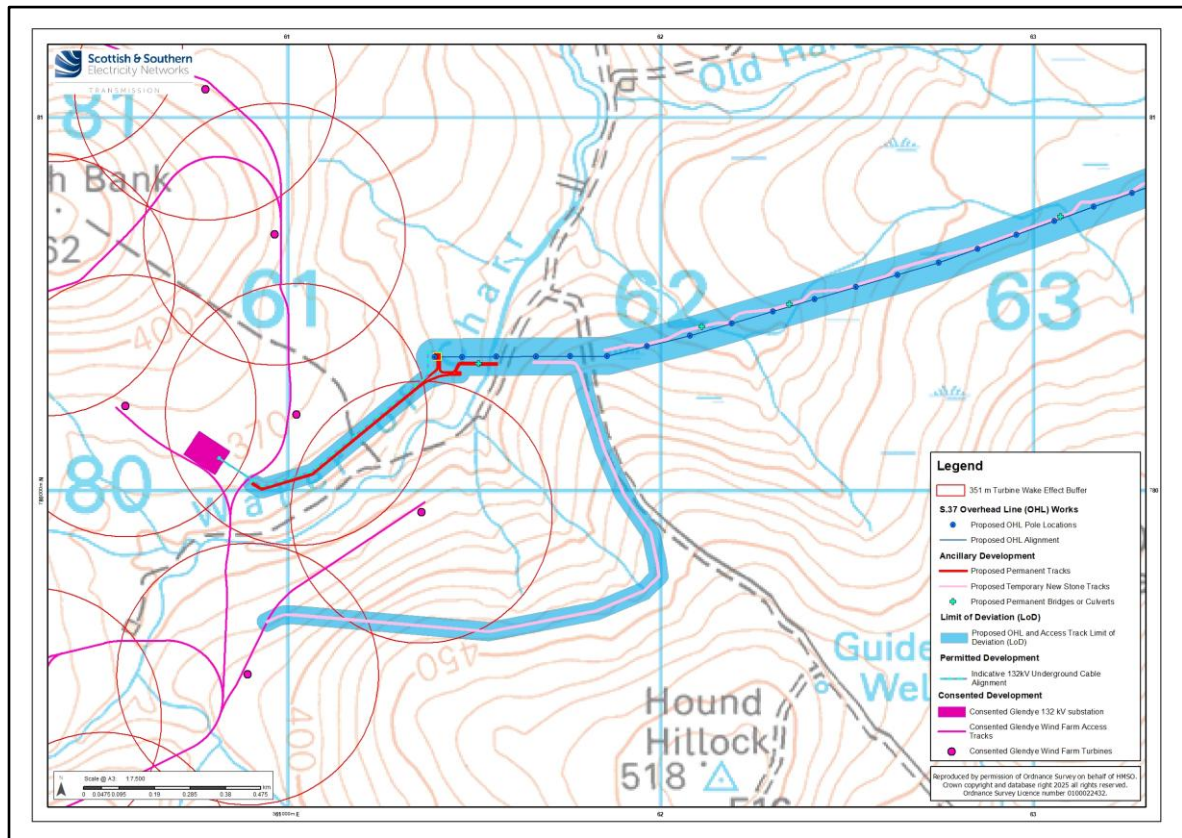
2.3.8 Overall, in consideration of the technical, environmental and economic challenges described above, the practical application of 132 kV UGC was not considered to be a reasonable alternative technology for the Proposed Development.

Partial Use of Underground Cable

2.3.9 Due to the technical constraints presented by existing and consented infrastructure on approach to the Glendye Wind Farm on-site substation and Fetteresso substation, the use of short sections of UGC is necessary to facilitate the connection.

2.3.10 When OHL components are within a certain distance of wind turbines, turbulence created by the rotating wind turbine can cause vibration and movement, which can lead to premature fatigue and failure of OHLs. This is termed the "wake effect". The wake effect created by turbulence from the wind turbines of the consented Glendye Wind Farm extends to a distance of approximately 660 m from the Glendye Wind Farm on-site substation (as shown indicatively in **Plate 2.1**). As such, to facilitate the connection to the on-site substation, a UGC is required to mitigate the wake effect caused by the wind turbines.

Plate 2.1: Wake Effect from Glendye Wind Farm



2.3.11 To facilitate a connection to the existing Fetteresso substation, the connection is required to cross an existing 275 kV OHL (currently being upgraded to 400 kV). Assuming under sailing of the 132 kV OHL (beneath the 400 kV OHL) could be achieved without compromising electrical clearance distances, an additional OHL would introduce safety risks associated with the installation and maintenance of both OHL circuits. Additionally, it would introduce a likely outage requirement on critical circuits out of Fetteresso substation, which are best avoided to limit the impact on the wider network. Crossing this existing infrastructure by UGC reduces the safety and maintenance risks and also limits the outage requirements on critical circuits. The use of UGC is therefore necessary to complete the connection into Fetteresso substation.

Considerations for OHL

- 2.3.12 As discussed, the general design preference for the Proposed Development is an OHL (with exception of either end of the connection where there would be a technical requirement for the use of UGC).
- 2.3.13 A steel trident pole has been determined by SSSEN Transmission to be the preferred design solution for the Proposed Development; primarily due to the elevation across much of this connection, which would not permit the use of trident wood poles, as they would be at risk of failure and would not pass technical authority review. The use of steel trident pole however, would: (i) provide a technically compliant solution; (ii) presents the lowest cost option; (iii) provides the required capacity of electricity export; and (iv) minimises environmental effects where possible.
- 2.3.14 It was considered that in comparison to a steel lattice tower, the steel trident pole would reduce environmental effects (in particular landscape and visual), in comparison to a taller steel lattice tower. Furthermore, the reduced footprint of the steel trident poles in comparison to a steel lattice tower would reduce the potential for direct effects to sensitive habitats, including peatlands and areas of deep peat within the western section of the Proposed Development.

2.4 Approach to Route and Alignment Selection

2.4.1 Guidelines for the routing of new high voltage overhead transmission lines have been established within the electricity supply industry. These guidelines are known as the 'Holford Rules'⁷ and have been widely used throughout the UK since the 1960s. The 'Holford Rules' set out a hierarchical approach to routing which advocates avoiding areas of high amenity value, minimises changes in direction, takes advantage of topography and minimises visual interaction with other transmission infrastructure.

2.4.2 SSEN Transmission has developed its own guidance, based on the principles set out in the Holford Rules, but broadening the basis for routing decisions to reflect contemporary practice, and providing a framework to ensure environmental, technical and economic considerations are identified and appraised at each stage of the routing process.

2.4.3 The approach to route and alignment selection has therefore been informed by SSEN Transmission's guidance³. The guidance splits the routing stage of a project into four principal stages, as follows:

- Stage 0: Routing Strategy Development;
- Stage 1: Corridor Selection;
- Stage 2: Route Selection; and
- Stage 3: Alignment Selection.

2.4.4 Each stage is an iterative process and involves an increasing level of detail and resolution, bringing cost, technical and environmental considerations together in a way which seeks to achieve the best balance at each stage. The stages undertaken can vary depending on the type, nature and size of a project and consultation is carried out at each stage of the process, where relevant. Each stage of the routing and alignment selection is described in further detail in the following sections.

2.5 Stage 0: Routing Strategy

2.5.1 This stage sets out the proposed strategy for the routing stage of a particular project, including the appropriate stages that should be followed and consultation requirements.

2.6 Stage 1: Corridor Selection

2.6.1 Only one corridor option was identified due to the scale and location of the Proposed Development and the identified connection points between Glendye Wind Farm on-site substation and the existing Fetteresso substation, which constrain any alternative corridor options. The process therefore commenced with the assessment of alternative routes within this single wider 'Corridor' location.

2.7 Stage 2: Route Selection - Overview

2.7.1 The route selection stage (Stage 2) of the Proposed Development involved the identification of route options within the Corridor. This included an appraisal of environmental, technical and economic constraints, prior to arriving at a proposed route to take forward to the alignment selection stage (Stage 3).

2.7.2 Route options were initially identified following desk-based review and site walkover surveys. In accordance with the steps outlined in the Holford Rules and SSEN Transmission guidance, the following principles were applied during the routing stages of the Proposed Development:

- Avoid, where possible, major areas of highest amenity value (including those covered by national and international designations and other sensitive landscapes);

⁷ Scottish Hydro Electric Transmission Limited (SHETL), The Holford Rules: Guidelines for the Routing of New High Voltage Overhead Transmission Lines with NGC 1992 and SHETL 2003 Notes; Revision 1.01

- Avoid, by deviation, smaller areas of high amenity value;
- Avoid sharp changes of direction and where possible, reduce the number of larger angle pole structures 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 woods where the scale of poles 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; and
- Approach urban areas through industrial zones and consider the use of undergrounding in residential and valued recreational areas.

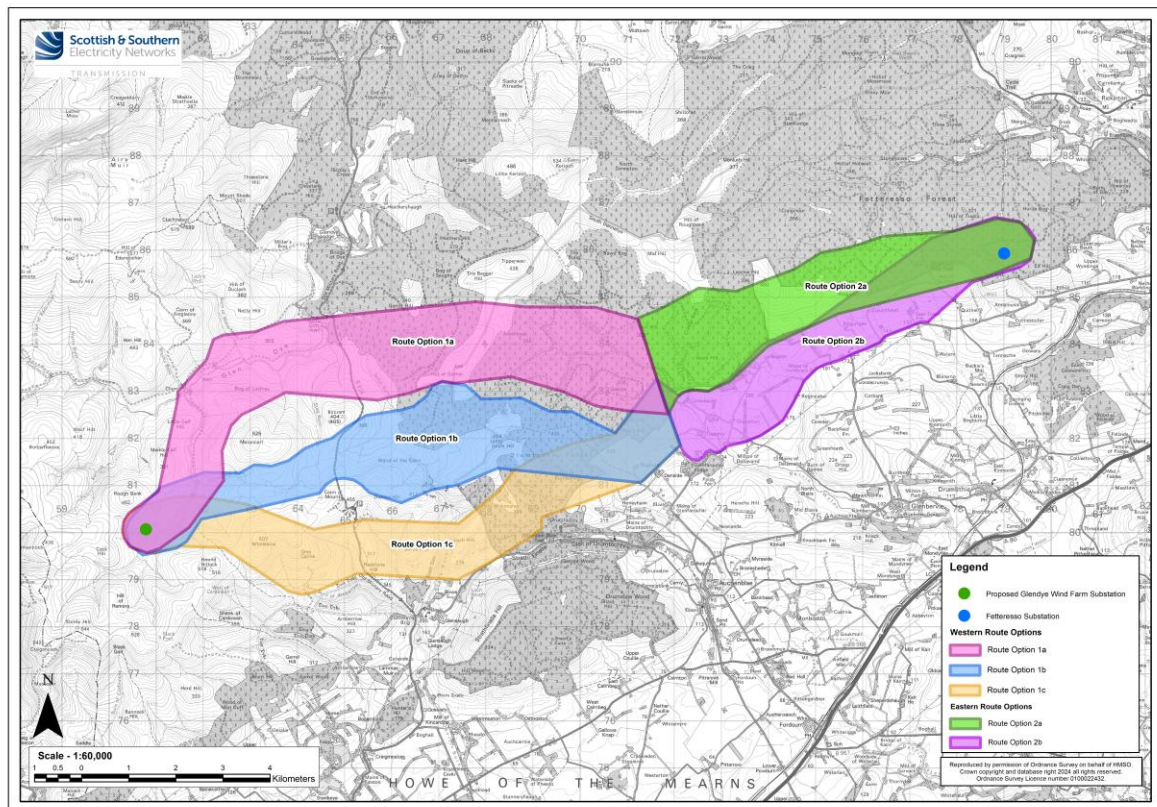
2.8 Stage 2: Route Selection - Route Options

2.8.1 Route options were initially identified by the Applicant utilising a digital tool, with further analysis and refinement by the project team, including input from environmental and engineering professionals, taking both physical and development constraints into account.

2.8.2 As shown on **Figure 2.1** (see also **Plate 2.2**, below), five potential route options were identified. These were split into 'Western Route Options' (1a, 1b and 1c) and 'Eastern Route Options' (2a and 2b). Any of the Western Route Options could join with any of the Eastern Route Options to form a complete connection between the consented Glendye Wind Farm on-site substation and the existing Fetteresso substation. The route options are described below:

- **Route Option 1a** - measuring approximately 13 km in length, this route option would leave Glendye Wind Farm on-site substation in a north easterly direction, traversing through Glen Dye for approximately 5 km before passing over the B974. It would then continue in an easterly direction for approximately 8 km through Drumtochty Forest before joining an Eastern Route Option.
- **Route Option 1b** – measuring approximately 9 km in length, this route option would leave Glendye Wind Farm on-site substation in an east north-easterly direction, over open moorland and rolling hills, before reaching the B974. From this point, the route option continues east across a mix of open moorland and forestry within the vicinity of Goyle Hill before joining an Eastern Route Option.
- **Route Option 1c** – measuring approximately 12 km in length, this route option would leave Glendye Wind Farm on-site substation in an easterly direction, passing over open moorland and steep terrain, towards the B974. After crossing the B974, this route option would continue eastwards on steep ground, before heading northeast through Drumtochty Forest before joining an Eastern Route Option.
- **Route Option 2a** – measuring approximately 8 km in length, this route option would head in a north easterly direction through sloping terrain in Drumtochty and Fetteresso Forests, passing through areas of open moorland southeast of Leachie Hill, prior to terminating at Fetteresso substation.
- **Route Option 2b** – measuring approximately 8 km in length, this route option would head in a north easterly direction over predominantly lowland farmland, comprising arable fields and areas used for pasture. A small number of properties and farm buildings are present within or in close proximity to the route. The route would overlap with Route Option 2a as it enters Fetteresso Forest, prior to terminating at Fetteresso substation.

Plate 2.2: Glendye Wind Farm Overhead Line Grid Connection Route Options



2.8.3 Appraisal of route options was undertaken against a number of environmental, engineering and cost criteria, set out within the SSEN Transmission guidance, as summarised below:

Environmental Criteria

- Natural Heritage - designations, protected species, habitats, ornithology, hydrology, geology and hydrogeology;
- Cultural Heritage - designations and cultural heritage assets;
- People – proximity to dwellings;
- Landscape and visual – designations, landscape character and visual;
- Land Use - agriculture, forestry, recreation and infrastructure; and
- Planning – policy and proposals.

Engineering Criteria

- Infrastructure Crossings - major crossings (overhead lines, rail, river, navigable canal, gas or hydro pipeline) and road crossings;
- Environmental Design - elevation, contaminated land, pollution and flooding;
- Ground Conditions – terrain and peatland;
- Construction and Maintenance - access, angle support; and
- Proximity – clearance distance, windfarms, communication masts, urban areas, metallic pipes.

Economic Criteria

- Capital – construction costs; and
- Operational – inspections and maintenance costs.

2.8.4 A Red-Amber-Green (RAG) rating was applied to each topic area for each route option, indicating potential constraint to development (red indicating high potential for the development to be constrained, amber intermediate potential and green low potential).

2.8.5 A summary of the constraints identified for each route option is provided below.

Western Route Options (1a, 1b and 1c)

- Route Option 1a includes tributaries of the River Dee Special Area of Conservation (SAC). It also includes regionally significant cultural heritage sites; two former pre-improvement townships (Glendye NO68SW0001 and Gauns Hill NO68SW0002)^{8,9}. The combination of these constraints, together with steep topography in this area, is likely to create a pinch point for any OHL through this route. In addition, the route passes through Glen Dye, an attractive glen which also forms a key part of the landscape setting from Clachnaben and Forest of Birse Special Landscape Area (SLA), and comprises trails used for recreation. The Glen Dye Moor Restoration Project also presents a constraint within this route option, particularly in relation to its woodland restoration objectives and the promotion of recreational use of the area. The route would also cut through a large area of commercial forestry and includes areas of Class 1 and 2 peatland¹⁰ (common across all route options).
- The potential constraints associated with Route Options 1b and 1c were comparable across all environmental topic areas. However, there are noticeable differences between the two options in terms of terrain and elevation. Route Option 1b follows a gently rolling landscape at an elevation of circa 400 m, with potential for deeper areas of peat (typically modified and likely to be in poor condition). In contrast, Route Option 1c traverses more steeply sloping ground, with elevations ranging from around 200 m to 500 m. Both routes would potentially have visibility from the Cairn o'Mount viewpoint, albeit these would potentially be greater from Route Option 1c, given an OHL within this route would appear within the main field of view to the south. From Route Option 1b, visibility from the Cairn o'Mount would largely be outwith the main field of view (to the north), with opportunities for this route option to be screened by topography. Indirect effects on the Cairn o'Mount Cairns Scheduled Monument (SM 4968) is also possible from both options, albeit the views from this Scheduled Monument are focussed south (towards Route Option 1c).
- From a technical perspective, Route Option 1a offers good access opportunities along its length, albeit any existing tracks would be subject to upgrading. In contrast, access is limited for Route Options 1b and 1c, with Route Option 1c particularly constrained due to both poor access and the steep terrain it would need to cross.

Eastern Route Options (2a and 2b)

- The eastern options are typically routed across a mix of forestry and lowland farmland. Route Option 2a crosses through the greatest extent of forestry, some of which includes areas of native and ancient woodland (Long Established of Plantation Origin (LEPO)). The requirement for felling and the creation of an operational corridor through the forestry could also adversely affect the character of the area.
- Route Option 2b passes through a more settled area than Route Option 2a, with an OHL likely to be situated closer to several dwellings, with potential for greater effects on visual receptors.
- From a technical perspective, there are good access opportunities identified for both options; however, the terrain is noted to be steeper for Route Option 2a. Route Option 2b passes closer to properties, and the clearance distance to wind turbines located within this route would need to be considered.

2.9 Stage 2 Route Selection: Reporting and Consultation

2.9.1 The route selection stage consultation process was designed to engage with stakeholders, including statutory and non-statutory consultees, local communities, landowners and individual residents, to invite comments on

⁸ Aberdeenshire HER - NO68SW0001 - WATERHEAD (online) Available at:

<https://online.aberdeenshire.gov.uk/smrpub/master/detail.aspx?tab=main&refno=NO68SW0001> [last accessed 08/10/2025]

⁹ Aberdeenshire HER - NO68SW0002 - GAUNS HILL, GLEN DYE (online) Available at:

<https://online.aberdeenshire.gov.uk/smrpub/master/detail.aspx?tab=main&refno=NO68SW0002> [last accessed 08/10/2025]

¹⁰ Carbon and peatland 2016 map | Scotland's soils

the route options identified. This is described further in the Pre-Application Consultation (PAC) Report that accompanies the application.

2.10 Stage 2 Route Selection: Identification of Proposed Route

- 2.10.1 The Applicant reviewed and considered the responses provided by stakeholders in relation to the route options outlined above. For Western Route Options, the Consultation Document (February 2024)¹¹ identified the River Dee SAC, presence of Class 1 and 2 peatland, landscape and visual effects and the Cairn o'Mount cairns Scheduled Monument as key environmental constraints. From an engineering perspective, access opportunities and steep terrain, particularly in the case of Route Option 1c, were noted as important considerations. Stakeholder comments also noted these constraints, with a number of concerns also raised by the local community in relation to the landscape and visual impacts of Route Option 1c. As such, Route Option 1c was discounted.
- 2.10.2 In determining whether Route Option 1a or 1b should form part of the Proposed Development, the Applicant concluded that Route Option 1b is preferable. This conclusion was based on several constraints associated with Route Option 1a, including its proximity to the River Dee SAC, the presence of regionally significant cultural heritage sites, existing woodland creation and peatland restoration proposals, and the potential for landscape and visual effects. It is recognised however that Route Option 1b crosses areas of Class 1 and 2 peatland, and that there are potential setting effects on the Cairn o'Mount cairns Scheduled Monument, along with wider landscape and visual effects. A carefully selected alignment would need to be considered within this route option to take these environmental effects into consideration.
- 2.10.3 For the Eastern Route Options (Route Options 2a and 2b), key constraints include the presence of forestry (particularly for Route Option 2a) and the more settled and agricultural landscape of Route Option 2b, along with its proximity to residential properties. A number of responses from the local community raised concerns specifically in relation to Route Option 2b, citing issues such as proximity to houses and residents, potential impacts on private water supplies, impacts on agricultural land, and the cumulative effect of both existing and proposed electrical infrastructure. There was a clear preference expressed for Route Option 2a over Route Option 2b from community responses, largely due to its greater separation from residential properties and other existing and proposed electrical infrastructure projects.
- 2.10.4 Taking technical constraints, environmental sensitivities and community concerns identified during the consultation process into account, the Applicant concluded that the proposed route options to be taken forward to the alignment selection stage should comprise Route Option 1b and Route Option 2a. The proposed route can be seen on **Figure 2.2**.

2.11 Stage 3 Alignment Selection: Alignment Options and Variants

- 2.11.1 The alignment selection stage sought to determine a proposed alignment within the proposed route that was identified during the route selection stage of the Proposed Development (described above).
- 2.11.2 As discussed in **Chapter 1: Introduction and Background** (in particular **paragraph 1.1.4**) the UGC elements of the Proposed Development would be undertaken utilising the Applicant's permitted development rights. As Permitted Development works do not require specific express consent, an appraisal of potential effects from the installation of the UGC is included in **Appendix 1.1: Permitted Development Works Appraisal**, for completeness. The alignment stage works for which consent is sought therefore only pertain to the OHL elements of the Proposed Development, which are to be assessed as part of the EIA Report.
- 2.11.3 A total of five alignment options and four alignment variants were identified for appraisal, based on consideration of technical and environmental constraints, together with feedback received from stakeholders at

¹¹ Glendye Wind Farm Overhead Line Grid Connection Consultation Document (Route Options) (February 2024), produced by SSEN Transmission

Stage 2 of the routing process. Consistent with the approach taken during the route selection stage, these have been categorised as 'Western Alignment Options' and 'Eastern Alignment Options'. The alignment options and variants are described below and displayed on **Figure 2.3**.

Western Alignment Options and Variants

- Alignment Option 1 is the most northerly of the Western Alignment Options, extending approximately 10.2 km between elevations of 330 m and 430 m above ordinance datum (AOD). It begins around 700 m east of the consented Glendye Wind Farm on-site substation, heading northeast across Glen Dye Estate moorland. The route crosses the B974 roughly 1.4 km north of the Cairn o'Mount Viewpoint and 1.2 km north of the Cairn o'Mount Cairns Scheduled Monument, before continuing east across open moorland, skirting the forest edge, north of the Waird of the Cairn. It then passes south of Goyle Hill and enters Drumtochty Forest for around 2 km.
- Alignment Option 2 lies between Alignment Options 1 and 3, running eastwards for approximately 10.2 km between 330 m and 420 m AOD. It starts about 700 m east of the consented Glendye Wind Farm on-site substation, following a similar alignment to Alignment Option 1, but generally on lower ground. The route crosses the B974 around 1 km north of the Cairn o'Mount Viewpoint and 800 m north of the Cairn o'Mount Cairns Scheduled Monument, continuing east across open moorland, south of the forest edge near the Waird of the Cairn. It then passes south of Goyle Hill and enters Drumtochty Forest for about 1.5 km.
- Alignment Option 3 is the most southerly of the Western Alignment Options, extending approximately 10 km between 330 m and 420 m AOD. It begins about 700 m east of the consented Glendye Wind Farm on-site substation, heading east-northeast across Glen Dye Estate moorland. The route crosses the B974 approximately 700 m north of Cairn o'Mount Viewpoint and 500 m north of the Cairn o'Mount Cairns Scheduled Monument. It then continues northeast through the Waird of Cairn, passing south of Goyle Hill before entering Drumtochty Forest for around 2 km.
- Alignment Variant 3a was developed to minimise potential setting impacts on the Cairn o'Mount Cairns Scheduled Monument, in comparison to Alignment Option 3.
- Alignment Variant 3b was developed to minimise potential impacts on ornithological constraints, as well as minimising interaction with a deeper area of peat.

Eastern Alignment Options and Variants

- Alignment Option 4 is the most northerly of the Eastern Alignment Options, running northeastwards for approximately 8.5 km between 170 m and 300 m AOD. From the southeast of Boy's Hill, it follows the forest edge past Corsebauld, then heads north along Maxie Burn, to the north of Scare Hill. The route continues east through forestry towards Brawliemuir, crosses open rough grazing near Hill of Bogjurgan, and enters Fetteresso Forest, where it transitions to UGC before connecting to Fetteresso substation.
- Alignment Option 5 lies south of Alignment Option 4 and extends northeastwards for approximately 9 km between 170 m and 270 m AOD. It starts from the southeast of Boy's Hill, heading northeast past Corsebauld and through forestry north of West Bogton. The alignment then crosses rough grazing towards the Hill of Bogjurgan, then enters Fetteresso Forest and transitions to UGC before connecting to Fetteresso substation.
- Alignment Variant 5a has been developed to minimise impacts on felling and future management of the forestry by following more closely the alignment of an existing track compared to other alignment options, whilst increasing the distance to properties at Corsebauld, West Bogton, Bogton and Brawliemuir compared with Alignment Option 5.
- Alignment Variant 5b was developed to minimise impacts on forestry in comparison to Alignment Option 5, by closely following the southern forest edge, to the north of Brae of Glenbervie.

2.11.4 A summary of the constraints identified for each alignment option and variant is provided below.

Western Alignment Options and Variants

2.11.5 All Western Alignment Options and Variants would cross through areas of Class 1 and Class 2 peatlands in the west, and open moorland and forestry to the east. Annex I habitats, including blanket bog and heathland, are present across all alignment options. The blanket mire is often found in mosaics with heathland and modified bog, and preliminary peat probing suggested a range of peat depths throughout the area. Habitat surveys completed at the alignment selection stage also indicated that although there are areas of blanket bog within the vicinity of all alignment options, it largely occurs in combination with modified bog and is subject to historical management pressures, as well as other erosion factors.

2.11.6 Following a site-specific peat depth probing exercise to inform alignment selection, it was determined that Alignment Option 1 would pass through the largest extent of Class 1 peatland, with the deepest area of peat noted in proximity to this alignment option. Alignment Option 2 and Alignment Option 3 would intersect similar extents of Class 1 peatland and similar peat depths were recorded in proximity to these alignments, although slightly shallower peat was recorded in proximity to Alignment Option 3. Based on the information collected at the alignment selection stage, Alignment Option 3 and Alignment Variant 3a would avoid the deepest areas of peat. Alignment Variant 3b would also minimise interaction with a deeper area of peat, whilst also minimising potential ornithological constraints.

2.11.7 Another important consideration for the Western Alignment Options and Variants is the potential for setting effects on the Cairn o'Mount cairns (SM 4968) Scheduled Monument. Views from the cairns towards the Proposed Development (to the north and northwest) are partially screened by local topography; however, open views are attainable from the vicinity of the viewpoint overlooking the Waird of the Cairn to the north. The alignment options would be visible on approach from the northwest, passing along the Waird of the Cairn from east to west, where all alignment options would be seen below the skyline and backdropped by moorland. Alignment Option 2 and Alignment Variant 3a are more likely to be screened by the topography in the view from the cairns, passing at a slightly lower elevation along the Cairn Burn to the north. In contrast, Alignment Options 1 and 3 would introduce infrastructure at slightly higher elevations than Alignment Option 2 and Alignment Variant 3a, at both greater and lesser distances from the monument, respectively. Due to their elevation and positioning, Alignment Options 1 and 3 (without Alignment Variant 3a) are likely to be more prominent in views to and from the cairns to the north, with greater potential to adversely affect the setting of the Cairn o'Mount cairns Scheduled Monument.

2.11.8 All of the Western Alignment Options and variants are comparable from a technical perspective, with limited access within the area requiring the construction of new temporary and permanent access tracks, regardless of the alignment option selected.

2.11.9 Given the above, it is considered that the least impactful of the Western Alignment Options is **Alignment Option 3** combined with **Alignment Variants 3a and 3b**.

Eastern Alignment Options and Variants

2.11.10 The Eastern Alignment Options and Variants traverse a mixture of forestry and lowland farmland.

2.11.11 Alignment Options 4, 5 and Variant 5a cross through areas of commercial forestry at Scare Hill. Alignment Option 4 crosses through the greatest extent of forestry of these three options and variants. Alignment Variant 5a was developed to minimise impacts on felling and future management of the forestry by following more closely to the alignment of an existing forestry track (in comparison to Alignment Options 4 and 5), whilst also increasing the distance from local properties. Whilst this variant would be routed through an area of woodland recorded as Long Established of Plantation Origin (LEPO) on the Ancient Woodland Inventory (AWI), current

land use practices within these areas involve cyclical felling for commercial forestry, resulting in a mixture of forestry age classes or clear fell, considered to limit its ecological value. Alignment Variant 5b was developed to minimise impacts on forestry by following an alignment to the south of the forest edge. All Eastern Alignment Options pass through a proposed woodland creation scheme.

- 2.11.12 From a technical perspective, there are good access opportunities across all Alignment Options and associated variants, with comparable terrain for all options.
- 2.11.13 It is therefore considered that the least impactful of the Eastern Alignment Options, particularly in terms of forestry, is **Alignment Option 5**, together with **Alignment Variants 5a and 5b**.

2.12 Stage 3 Alignment Selection: Reporting and Consultation

- 2.12.1 The alignment selection stage consultation process was designed in a similar manner to the routeing stage, and included engagement with statutory and non-statutory consultees, local communities, landowners and individual residents, to invite comments on the alignment options and variants identified. This is described further in the PAC Report that accompanies the application.

2.13 Stage 3 Alignment Selection: Identification of Proposed Alignment

- 2.13.1 The Applicant reviewed and considered the responses provided by stakeholders of the alignment options and variants set out within the Consultation Document¹² (October 2024), prior to determining a proposed alignment.
- 2.13.2 During alignment stage consultation, several comments requested further explanation for using OHL rather than UGC for the connection. Stakeholders also sought clarification on further assessment work, particularly in relation to landscape and visual, private water supplies, cultural heritage, peat, protected species and ornithological constraints. Responses recommended continued stakeholder engagement and emphasised the requirement for comprehensive surveys and assessment as the Proposed Development progresses. The cumulative effect with other infrastructure in the local area was also noted, as well as impacts on forestry.
- 2.13.3 Given the alignment options presented at consultation had potential to cross both forestry and peatland restoration areas, further stakeholder meetings were held with the aim of achieving a solution that minimises impacts on the forestry resource, as well as potential for impact to peatland restoration schemes. Subsequently, the Applicant identified a new alignment variant to move the alignment approximately 800 m north near Goyle Hill, to avoid the existing peatland restoration schemes located at Goyle Hill and Gothie Hill, and to minimise impacts on forestry resources. This is shown on **Figure 2.4** as 'Alignment Variant – Avoidance of Sensitive Habitats'.
- 2.13.4 In respect of comments received in relation to the western part of the alignment, and views expressed in relation to landscape, visual, cultural heritage and recreational sensitivities, whilst it has not been deemed practicable to underground this section of the connection (see **Section 2.3** of this Chapter), the least impactful alignment (Alignment Option 3 and Alignment Variant 3a) has been selected to minimise impacts where practicable, by making use of local topography. Specifically in relation to views from the Cairn o'Mount Cairns Scheduled Monument, Historic Environment Scotland agreed that this combination of alignment options would have the least impact¹³.
- 2.13.5 A proposed alignment was therefore identified that considered the comments received through consultation, in light of environmental, engineering and cost considerations. The proposed alignment is shown on **Figure 2.5** and comprises **Alignment Option 3** (with the use of **Alignment Variant 3a and Variant 3b**) in combination

¹² SSEN Transmission Glendye Wind Farm Overhead Line Grid Connection Alignment Options - Consultation Document (published October 2024)

¹³ Historic Environment Scotland (November 2024) consultation response to the Glendye Wind Farm Grid Connection Project Alignment Options Consultation Do (published October 2024)

with **Alignment Option 5** (with the use of: (i) **Alignment Variants 5a and 5b**; and (ii) the variant to avoid sensitive habitats shown in **Figure 2.4**).

2.14 Further Consideration of Alternatives during the EIA Process

2.14.1 The earlier sections in this Chapter focus on the consideration of alternatives by the Applicant prior to this EIA stage, during both the project development and consultation phases. However, during this EIA process, the Applicant has continued to reflect upon the decisions made during the routeing stage of the project and the means by which environmental effects of the selected technology type, OHL, could be further minimised.

2.14.2 As referred to in paragraph 2.3.5 of this Chapter, the IET published a study in 2012 into the cost comparison of electricity transmission infrastructure. An update to the 2012 report was released in 2025 ("the 2025 IET Report"¹⁴) which provides a further and more recent source of guidance on the indicative costs of different transmission technologies. The 2025 IET Report found that OHL was the most economic form of electricity transmission, in comparison to both onshore UGC and subsea cables. The 2025 IET Report includes [within Section 5] a cost comparison based on the parameter of the lifetime cost to transmit one Mega Watt (MW) by a distance of one kilometre (km). The indicative costs are necessarily based upon assumptions as recorded in the report (e.g. typical circuit lengths, operational voltages and configurations across the National Grid) but nonetheless offer a useful guide to the factors that generally make OHL the most cost-effective technology.

2.14.3 **Table 2.1** below summarises the IET report Table 5.3. For present purposes, the average lifetime cost of UGC was estimated to be 4-5 times greater than OHL (page 8).

Table 2.1: IET Indicative Cost Comparison

Technology	Cost - £/MWkm
OHL	£1190 MWkm
UGC	£5350 MWkm

2.14.4 Further to the IET report, relevant policy in the form of the Overarching National Policy Statement of Energy dated 2025 (EN-1)¹⁵ and its supporting National Policy Statement for Electricity Networks Infrastructure dated 2025 (EN-5)¹⁶ also support the use of OHL over UGC on economic grounds. EN-5, in particular, introduced the UK Government's '*strong starting presumption*' in favour of an overhead line (para. 2.9.21), on the basis of, amongst other factors, the '*additional cost of the proposed underground... alternatives, including their significantly higher lifetime cost of repair and later uprating*' (para. 2.9.26).

2.14.5 During the EIA stage, further changes to the alignment of the Proposed Development were generally minor in nature. These included an alteration to the alignment crossing of the B974 to the north of Cairn o'Mount whereby the alignment was moved approximately 100 m to the north, to take advantage of the visual containment offered by lower lying topography.

2.14.6 Other considerations that have formed part of this EIA process included:

¹⁴ Mott MacDonald in Conjunction with IET: A comparison of Electricity Transmission Technologies an: Costs and Characteristics (April 2025) Consultation on scheme design for Bill Discounts for Transmission Network Infrastructure (online) Available at: https://www.theiet.org/media/axwkktkb/100110238_001-rev-j-electricity-transmission-costs-and-characteristics_final-full.pdf [last accessed 08/10/2025]

¹⁵ Department of Energy Security and Net Zero (2025) Overarching National Policy Statement EN-1 Overarching National Policy Statement for Energy

¹⁶ Department of Energy Security and Net Zero (2025) Overarching National Policy Statement of Energy: EN-5 Electricity Networks National Policy Statement - final word version

- Making use of existing tracks as part of the access strategy as far as practicable, to minimise the construction of new tracks. This included the use of the Glendye Wind Farm access track to facilitate access to the west of the connection, with use of existing forestry and farm tracks where possible;
- Minimising impacts on deeper areas of peat where possible, informed by detailed peat probing and peat condition surveys. It should be noted that the peatland condition assessment (see **Appendix 9.3**) confirmed that the peatland present across the western part of the Proposed Development is not in near natural condition. Given the engineering design constraints of linear OHL developments, avoidance of peat >1 m depth is not possible for the Proposed Development; however, interaction with deeper areas of peat has been minimised where possible; and
- Minor changes to access tracks have been made, to minimise impacts to forestry operations and to incorporate landowner feedback.

2.15 Summary

- 2.15.1 The work undertaken during the routeing and alignment stages of the Proposed Development enabled a rigorous consideration of reasonable alternatives with respect to route options, alignment selection and the consideration of design solutions available for the Proposed Development. The Applicant has, consistent with its statutory obligations, balanced the full range of environmental, technical and economic considerations when developing and designing the Proposed Development.
- 2.15.2 Further consideration of alternatives during the EIA stage has also been undertaken, focusing on minor alignment changes and the siting of pole positions and ancillary infrastructure as more detailed environmental and engineering information became available. The Applicant's decisions have been informed throughout by extensive experience of its own engineering and environmental teams and the expertise of external consultants appointed for the EIA process. Furthermore, the Applicant recognises the sensitive nature of projects that introduce new transmission infrastructure into the landscape, and mindful of that sensitivity, has ensured the EIA process has been robust. Where impacts have been identified that cannot be avoided or further minimised, the NPF4 mitigation hierarchy has been applied, with the approach to mitigation and offsetting of impacts detailed within topic specific technical chapters of the EIA.
- 2.15.3 The final alignment of the Proposed Development is discussed further in **Chapter 3 - The Proposed Development** and presented in **Figures 3.1a-e**.