

CLOICHE WIND FARM DESIGN AND ACCESS STATEMENT

April 2020



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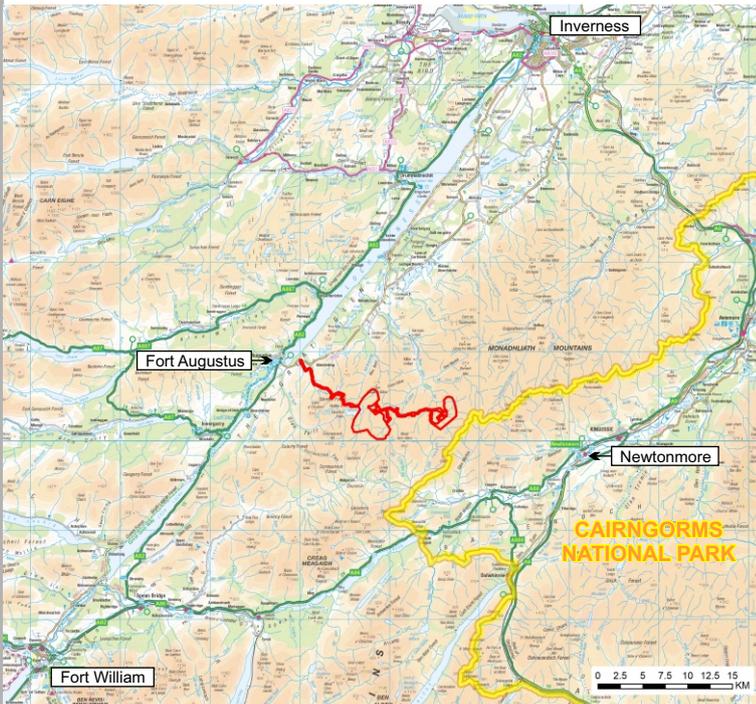
 **sse**
Renewables

INTRODUCTION

The Proposed Development

SSE Generation Ltd (SSEG), “the Applicant”, is proposing to construct a new onshore wind farm to generate renewable electricity from wind power. The Proposed Development is located on Glendoe and Garrogie Estates, adjacent to the operational 66 turbine Stronelairg Wind Farm and the 100MW Glendoe Hydroelectric Scheme.

The Proposed Development is being promoted by the Applicant in support of the Scottish Government's targets for reduction in greenhouse gas emissions to net-zero by 2045 and energy generation via renewable sources to an equivalent of 50% by 2030.



The location of the Proposed Development is approximately 11km to the south-east of Fort Augustus.

The boundary of the Cairngorms National Park lies around 1.5km to the east of the Proposed Development.

Site Location Plan

The Proposed Development would consist of 36 turbines with a maximum tip height of 149.9m, an on-site substation, a welfare and control building and two permanent Light Detection and Ranging (LiDAR) stations to monitor meteorological data and associated access tracks.

Temporary elements required to construct the Proposed Development would include three site compounds (one near the main access on the B862 and two on the plateau), up to nine borrow pits and two concrete batching plants.

The Design and Access Statement

This Design and Access Statement details the evolution of the design for the Proposed Development, and in particular the key considerations which were taken on board in developing the preferred turbine layout. It also provides a presentation of the preferred turbine layout and the proposed design and finishes of individual components.

The Design and Access Statement is laid out in the following sections:

1. Site Context;
2. Design Development;
3. Materials and Finishes; and
4. Access Considerations.

SECTION 1. SITE CONTEXT

Landscape Context

The Proposed Development site is located within a relatively remote, upland plateau area of the Monadhliath Mountains, approximately 11km to the south-east of Fort Augustus. The development site already accommodates the operational 66 turbine Stronelairg Wind Farm and the operational 100MW Glendoe Hydroelectric Scheme. In addition, consent has been granted for the 14 turbine Dell Wind Farm, located just to the north-west of Stronelairg.

The landform of the plateau in this location, forms a 'bowl' shape, being contained by surrounding hills and mountain summits which provide a degree of enclosure, restricting longer distance views. The existing developments of Stronelairg and Glendoe are situated within this bowl landform, and the Proposed Development would also be accommodated within this area.



The Stronelairg Wind Farm is set within a 'bowl' shape in the landform which limits its visual extent and results in it usually appearing back-clothed by the surrounding slopes which contain it. Lower features such as tracks and the substation are seldom seen, other than from the slopes and summits of the hills which surround it.

Stronelairg Wind Farm, from Carn a' Chuilinn



Completed in 2009, the Glendoe Hydroelectric Scheme has a capacity of 100MW. It comprises a dam and reservoir fed by 17 smaller intake weirs scattered throughout the Proposed Development site, with water channelled via tunnels and buried pipelines, to an underground cavern power station. The dam is just under 1km long and 35m high.

Glendoe Hydroelectric Dam and Reservoir and Intake Tower

The wider landscape is one of generally large scale patterns, with contrasting high mountain summits and plateaux, and deep, often steeply sided glens and lochs. The glens are the main focus of settlement and communication and provide a contrast to the remote mountains and moorlands. The numerous high mountains and busier glens make the wider area a popular destination for tourism and recreational users. However, the Proposed Development site itself is largely removed from the main visitor attractions of the area.

Existing wind farms and other infrastructure are frequently present within this landscape, mostly concentrated on the plateau areas to either side of the Great Glen, forming clusters of turbines occasionally seen from the straths and glens but more often forming a feature of the upland landscape.

SECTION 2. DESIGN DEVELOPMENT

In terms of aesthetic appeal and minimising potential effect on the wider area, the key elements of the Proposed Development would be the wind turbines and permanent access tracks. Other elements such as the substation and LiDAR positions would affect a more localised area. In arriving at the preferred design option, consideration has been given to a range of factors including technical constraints, environmental constraints, economic factors, sustainability and health and safety.

The design process for the Proposed Development has involved the following key stages:

- Stage 1. Strategic high level review: A landscape and visual led exercise was undertaken to identify potential development areas to allow environmental surveys to be undertaken;
- Stage 2. Optimised design layout: Initial turbine layout options which optimised the wind resource within the development areas were produced;
- Stage 3. Landscape and visual review: A landscape and visual review of the optimised layouts was undertaken identifying turbines for removal and adjustment;
- Stage 4. Design evolution and refinement: Following the acquisition of environmental survey work and detailed peat probing, a number of adjustments to the final layout were made to minimise environmental effects whilst ensuring a workable engineering solution.

Stage 1. Strategic High Level Review

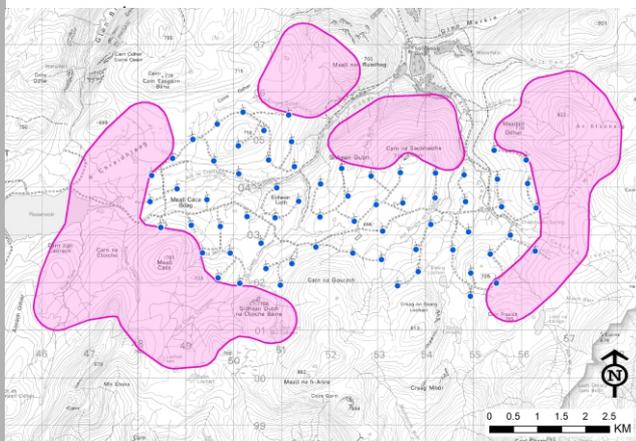
A landscape and visual led high level review was carried out in 2017 to identify the potential for additional large turbines adjacent to Stronelaig Wind Farm. This review explored opportunities for turbines to the north, east and west of Stronelaig Wind Farm and included a review of some of the turbines that had been proposed in the original Stronelaig Wind Farm application.

To the north, potential opportunities were identified in the areas around Carn na Saobhaidhe and Meall nan Ruadhag. However, after initial studies were undertaken, this area was discounted due to technical constraints around steep slopes and potential visual impacts.

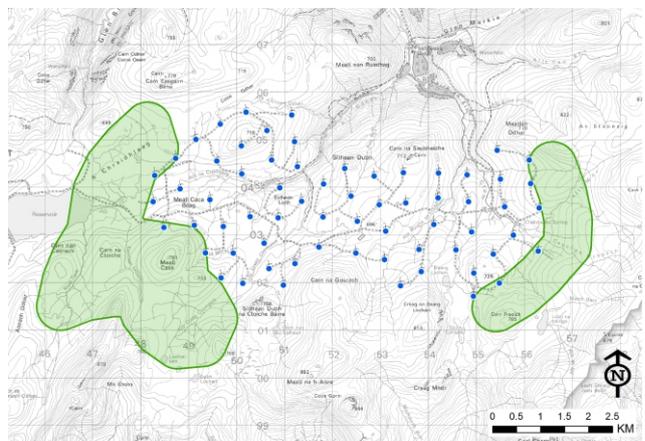
To the west, options for turbines on the Glendoe Estate had not previously been explored. Some ornithological concerns were raised about individual turbines. However, it was felt that these could be overcome through the design development stage and these areas were taken forward for further study.

To east, the area around Meallan Odhar was considered for development. Through the review, the most northern areas were discounted due to ornithological constraints. However, the more southern areas were considered suitable to be taken forward for further study.

The result of the high level review led to the early identification of possible scope for further turbines to the west and east of the operational Stronelaig Wind Farm. These areas were therefore brought forward and presented in the Scoping Report.



Areas considered in High Level Review



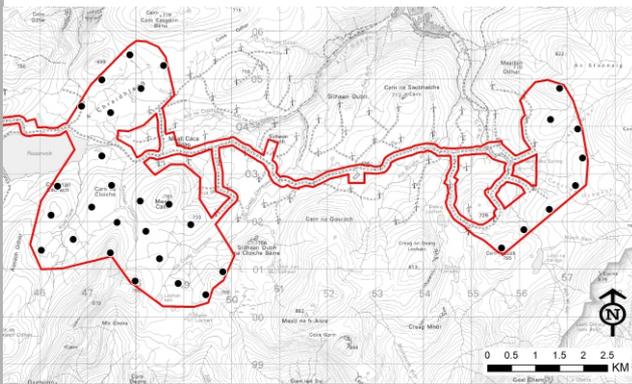
Potential Development Areas brought forward for Scoping

Stage 2. Optimised Design Layout

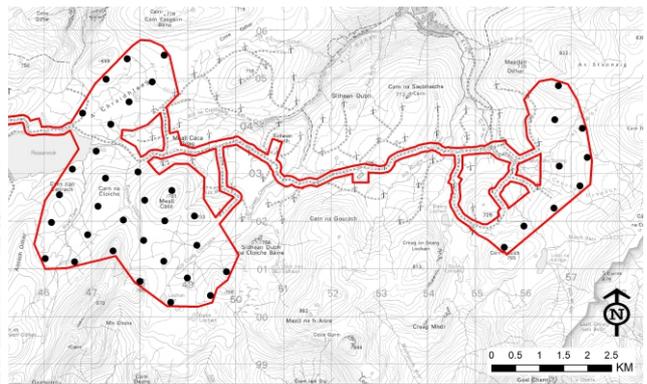
Following a preliminary design workshop where the key environmental constraints of the development area were discussed, two optimised layouts for wind resource were developed by the Applicant's wind resource team, taking account of locational environmental constraints: peat depth and a 50 m watercourse buffer.

The two layouts developed comprised:

- A 32 turbine layout (the T32 Layout); and
- A 40 turbine layout (the T40 Layout).



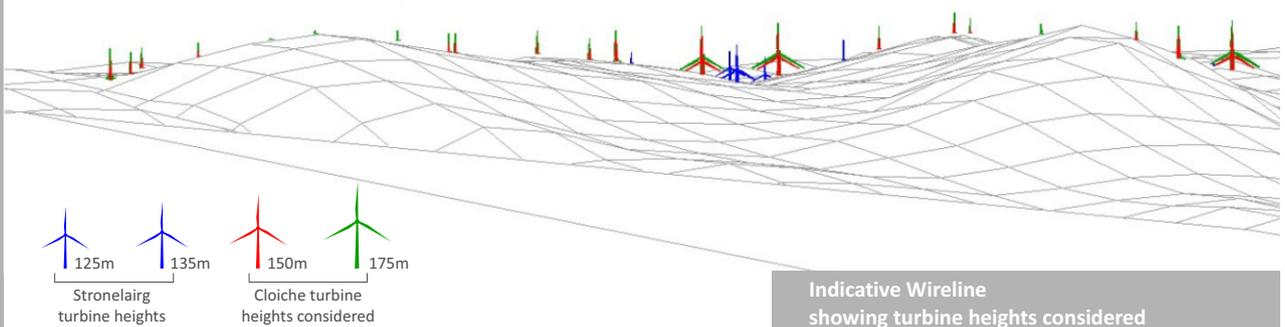
The T32 Layout, optimised for wind resource



The T40 Layout, optimised for wind resource

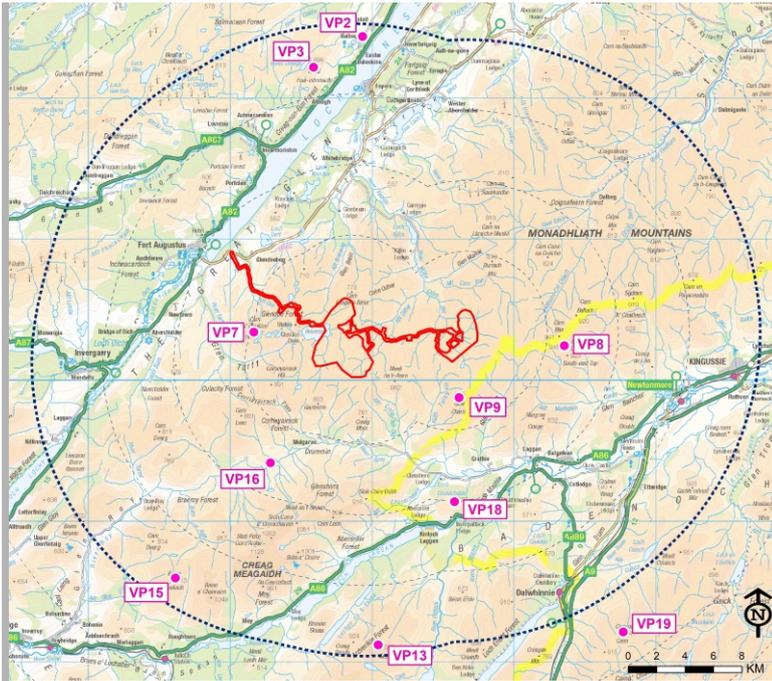
During the initial phases of the design, turbine tip heights were considered up to 175m. Heights of 150m and 175m were considered at the preliminary design workshop. However, a tip height of 149.9m was selected. This lower tip height has the following advantages:

- The lower tip height would lead to turbines being potentially visible from fewer areas and would lead to them appearing as a smaller feature when visible;
- The lower tip height would appear more in proportion to the existing turbines of Stronelaig Wind Farm;
- 149.9m tip height would avoid the requirement for all turbines to be lit by visible aviation lighting; and
- The smaller turbine components associated with the 149.9m turbines would be less challenging to transport.



Stage 3. Landscape and Visual Review

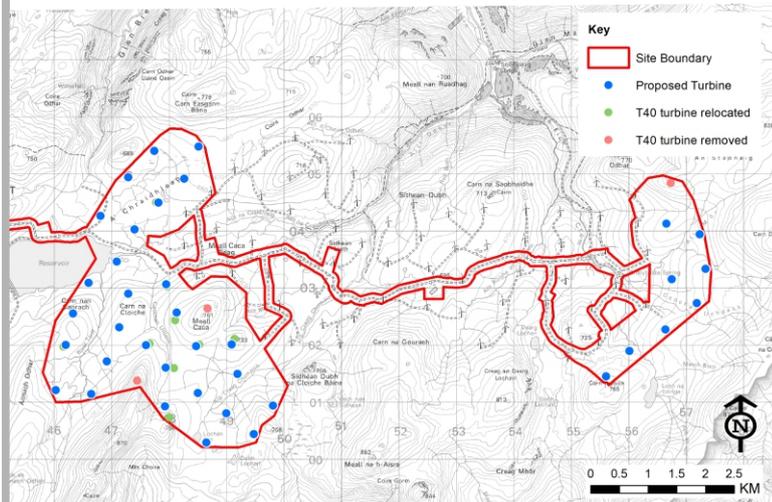
A landscape and visual review of the optimised layouts concluded that despite the greater number of turbines involved in the T40 Layout, the effects would be similar for both layouts and therefore the T40 Layout was progressed. A more detailed landscape and visual review was undertaken for this layout, giving consideration to the visual composition when viewed from the surrounding area, and the potential effects on sensitive landscape areas and viewpoints such as the Cairngorms National Park, Wild Land Areas and the Great Glen. Care was taken to avoid any visibility from Urquhart Castle which is considered particularly sensitive. This review considered recommendations of the Highland Council Onshore Wind Energy Supplementary Guidance, November 2016 (with addendum, December 2017).



The landscape and visual review considered the appearance of the Proposed Development from all viewpoints (VPs) included in the Landscape and Visual Impact Assessment (LVIA). However, particular focus in achieving a good composition was given to ten VPs, considered to cover a good representative range of viewing directions:

- VP2 – Great Glen Way, Balbeg;
- VP3 – Meall Fuar-mhonaidh;
- VP7 – Carn a' Chuilinn;
- VP8 – Carn Dearg;
- VP9 – Geal Charn (Monadhliath);
- VP13 – Geal Charn (Ardverikie);
- VP15 – Beinn Teallach;
- VP16 – Footpath east of Loch Spey;
- VP18 – Loch na Lairige; and
- VP19 – Carn a' Caim.

Priority Viewpoints for Landscape and Visual Review of Layouts



As shown, the landscape and visual review led to a number of modifications to the T40 Layout to improve the visual composition. This included the removal of three turbines which were at a higher elevation and therefore more prominent than others, and the relocation of several other turbines to reduce their elevation and create a more balanced composition.

This revised layout was then taken forward for further consideration with regards to other environmental subjects.

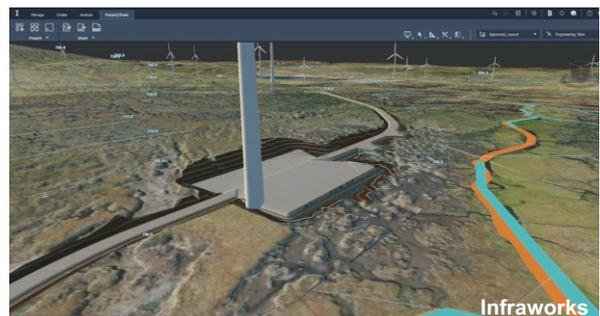
Revised layout, modified for landscape and visual considerations

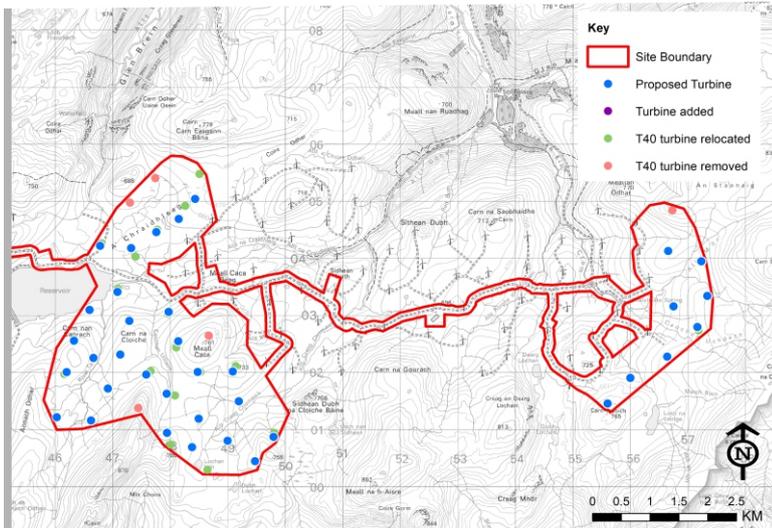
Stage 4: Design Evolution and Refinement

Following the completion of more detailed environmental survey work, further iterations were made to the layout:

- Removal of two turbines located at the north of the western cluster and relocation of one turbine to the south of the western cluster closer to the centre for ornithological sensitivities;
- Small adjustments to individual turbines to avoid areas of deeper peat, steep ground and surface water buffers;
- The addition of one turbine in the centre of the western cluster to compensate for turbines removed.

At this stage, the Proposed Development has been subject to an iterative and detailed engineering and operational design process through the use of AutoDesk InfraWorks infrastructure design software. This allowed development of a more detailed design, avoiding localised constraints such as deep peat or difficult ground conditions. The aim of this exercise is to provide more certainty on the layout at application stage, thus minimising further iterations during the detailed design and construction phases.





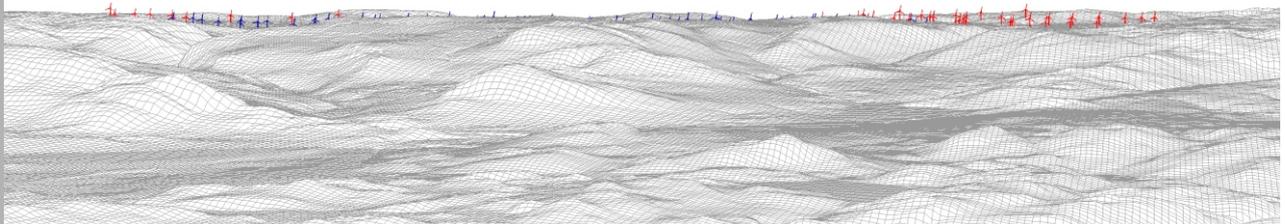
The final layout presented with the application comprises 36 turbines and is considered to be the optimum layout, achieving the maximum output whilst minimising the potential for environmental effects.

Final Layout, showing modifications from the T40 Layout

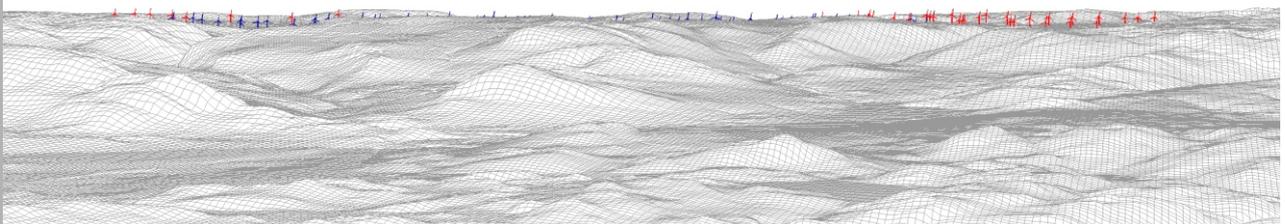
Illustrative Comparison of Layouts



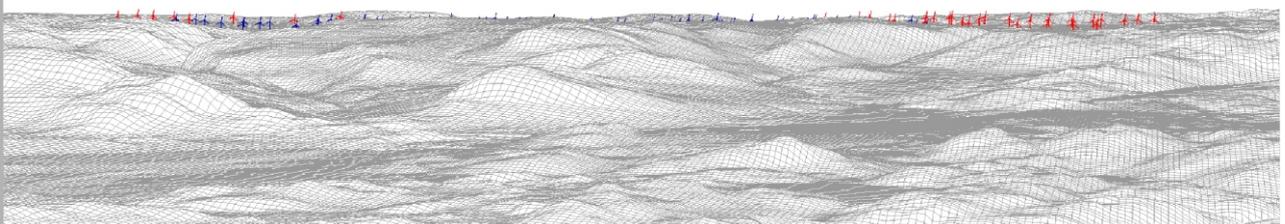
VP3: Meall Fuar-mhonaidh



VP3: Meall Fuar-mhonaidh - Initial T40 Layout



VP3: Meall Fuar-mhonaidh - Revised Layout for Landscape and Visual Considerations

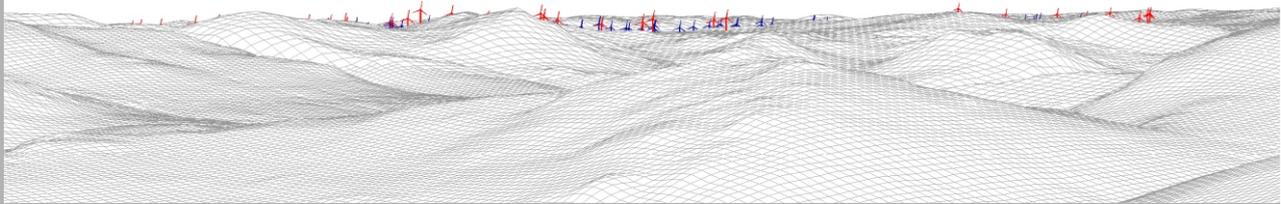


VP3: Meall Fuar-mhonaidh - Final Layout

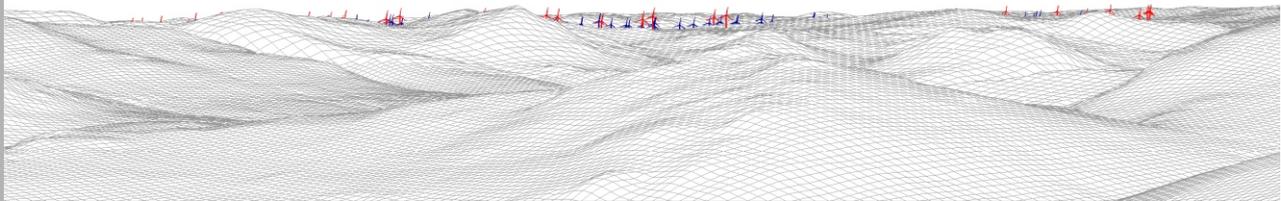
Key issues with layout design considered in the view from Meall Fuar-mhonaidh, included the removal of turbines from the T40 layout which were higher and more prominent than others and reduction in the appearance of turbines above the horizon. The revisions to the layout have brought almost all hubs below the skyline and are considered to give a reasonably balanced layout which ties together well with the existing turbines of Stronelaig Wind Farm.



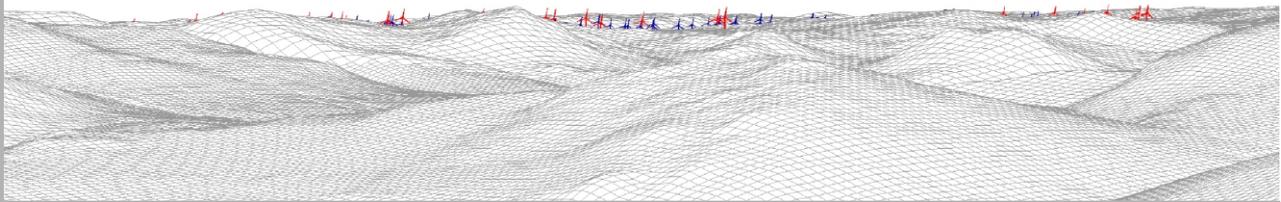
VP15: Beinn Teallach



VP15: Beinn Teallach - Initial T40 Layout



VP15: Beinn Teallach - Revised Layout for Landscape and Visual Considerations

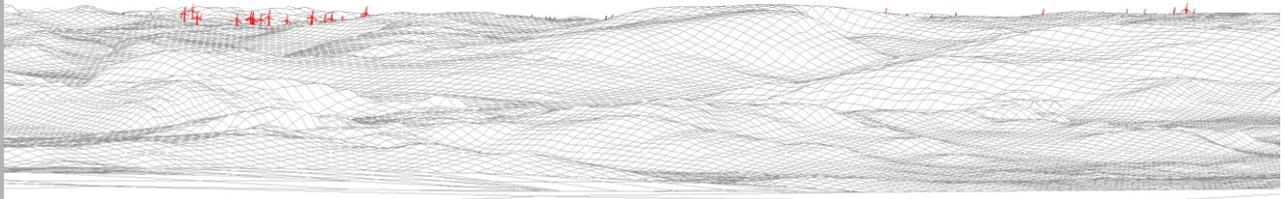


VP15: Beinn Teallach - Final Layout

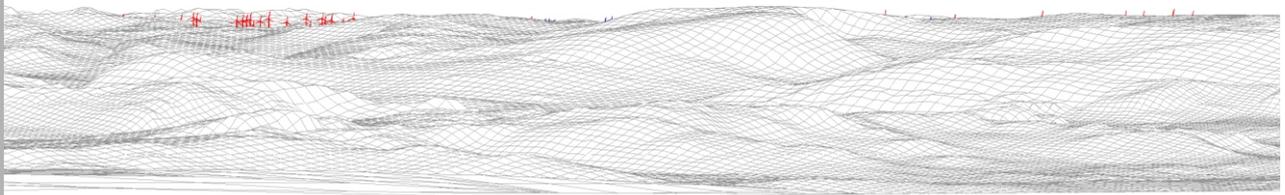
The key consideration of design modifications relating to the view from Beinn Teallach, involved reducing the perceived turbine heights, in order to maintain the pattern of the Stronelaig Wind Farm, as groups of turbines seen between the intervening hills. This involved the removal of the highest and most prominent turbines and adjustment of others, to ensure that no turbines in the western cluster form the highest element on the skyline and that as far as possible, hubs are kept below the horizon line. Although the Proposed Development is closer to this viewpoint than Stronelaig, and therefore turbines appear larger, the layout is considered to reflect the existing pattern of turbines in this view.



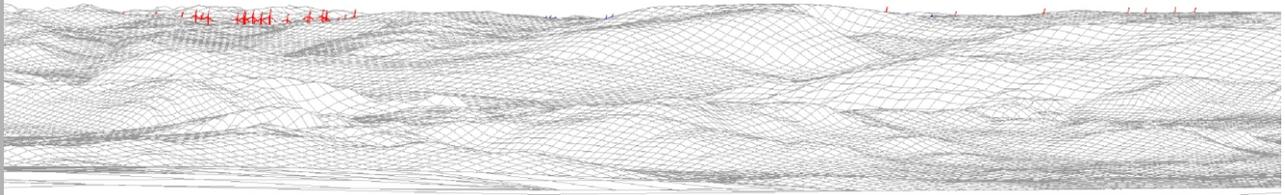
VP19: Carn na Caim



VP19: Carn na Caim - Initial T40 Layout



VP19: Carn na Caim - Revised Layout for Landscape and Visual Considerations



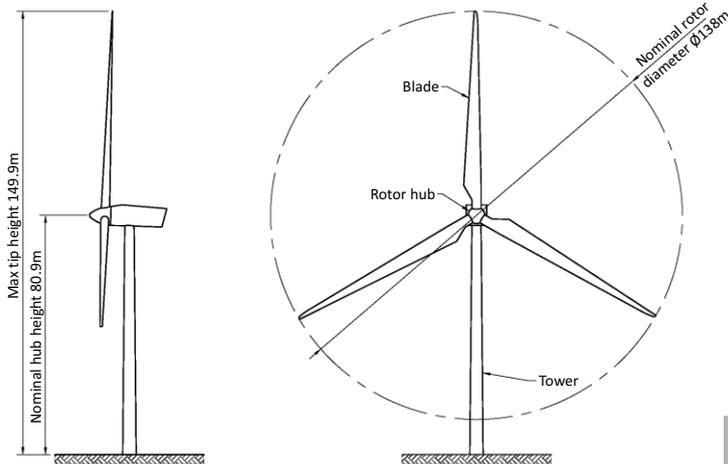
VP19: Carn na Caim - Final Layout

The key consideration of design modifications relating to the view from Carn na Caim, involved retaining a compact and well distributed layout within the western cluster, and minimising the prominence of eastern cluster turbines above the skyline. The removal of the most prominent turbines brought most turbines and blades below the level of the far horizon whilst the minor adjustments to the positioning of some of the remaining turbines improved the composition of the layout to reduce clustering as far as possible.

SECTION 3. MATERIALS AND FINISHES

Wind turbines

The 36 wind turbines would be three-bladed horizontal axis turbines, up to 149.9m in height with a blade diameter of up to 138m. The turbines would be automatically controlled to ensure that they face directly into the wind at all times and therefore the orientation of the wind farm would alter with changes in wind direction.



The turbine towers would be of tapering tubular rolled steel plate construction. The blades would be made from fibre-reinforced epoxy. The finish of the turbines is proposed to be a semi-matt pale grey colour. The transformers would be located internally to each turbine, thus avoiding the need for an adjacent structure.

The final choice of turbine would be dependent on economics and available technology at the time of construction.

Nominal Turbine Dimensions

Tracks and hardstandings

Approximately 26km of new tracks would be required to reach individual turbines. New tracks would have a minimum 4.5m wide running surface with localised widening on corners and passing places to access the turbines from the existing access tracks, during both construction and operation. The access tracks would be designed to incorporate passing places that would be suitable for construction plant.

When designing new track alignments, care has been taken to minimise water crossings and avoid sensitive areas such as deep peat. This has been facilitated by the use of Infracore.

Depending on local ground conditions, two different track construction methods would be used:

- **Floating tracks:** Where the track construction is laid onto a geotextile membrane avoiding the need for excavation. This method allows continued flow of sub-surface water and avoids the unnecessary generation of peat for re-use. Floating tracks would be used where the peat depth is greater than 1m and where ground conditions such as gradient and peat stability allow.
- **Cut tracks:** Where the topsoil and peat are stripped back to expose a suitable bearing stratum on which to construct the track. Depending on topography cut slopes or embankments are required. Culverts are required to ensure the uninterrupted flow of water below the track. Cut tracks would typically be used on ground where the peat layer is less than 1m and where ground conditions are not suitable for a floating track design.



Floating track construction - Glendoe Hydroelectric scheme



Cut track - Glendoe Hydroelectric scheme

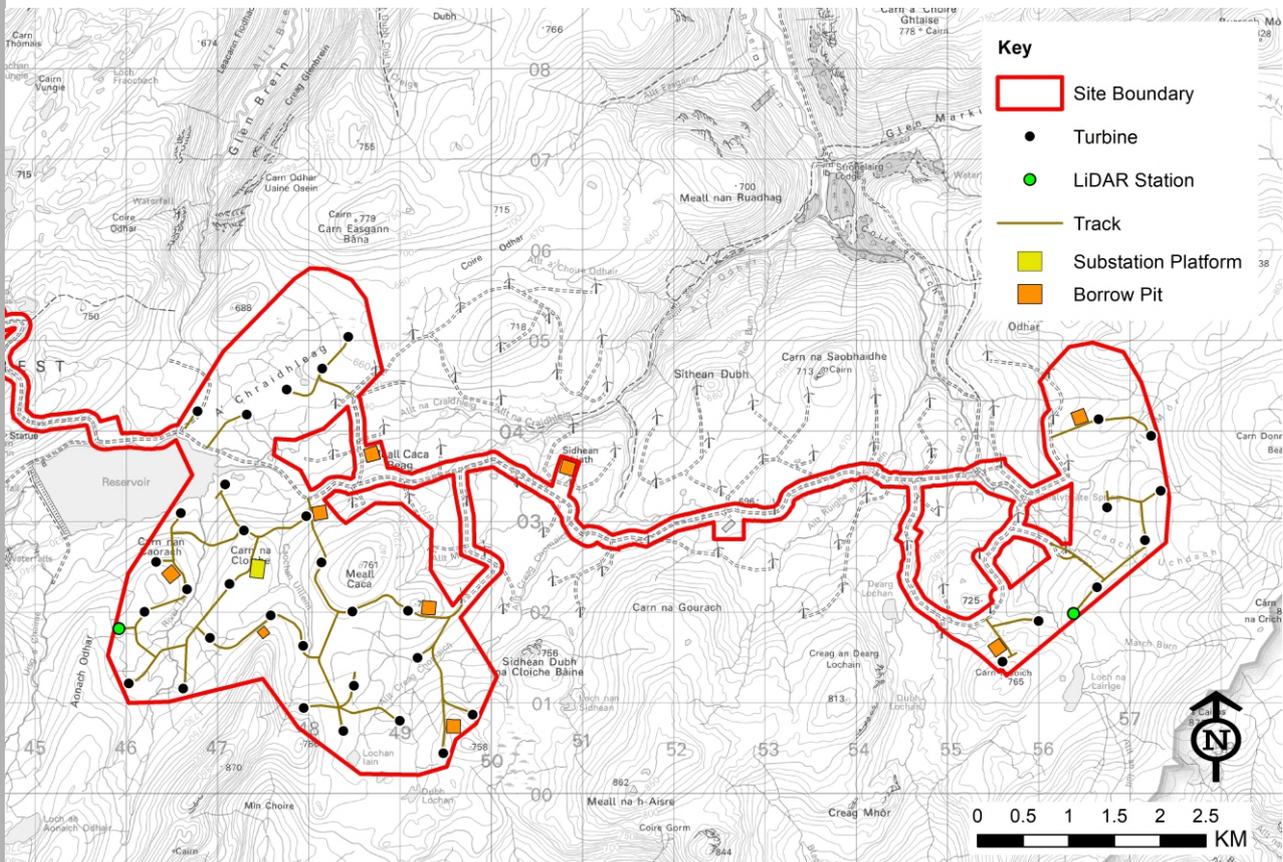
Areas of hardstanding would be required at each turbine location to allow the placement of cranes for construction and maintenance, and at the substation and welfare building sites.

The careful removal of the vegetated peat layer prior to construction would be fundamental to ensuring that the edges of the new cut tracks and hardstanding areas would re-establish and marry in with the adjacent vegetation. Cutting and embankment slopes would be carefully graded to tie in to the surrounding landscape at a gradient suitable for the replacement of vegetated peat to minimise the visual appearance of the disturbed footprint. Where suitable quantities of vegetated peat were available, this would also be used on the shoulders of floating tracks to help soften the transition with the adjacent undisturbed moorland. Peat would not be spread on any undisturbed ground.

It is anticipated that tracks and hardstanding areas would be surfaced with crushed stone, sourced from on-site borrow pits. This stone is anticipated to have a similar colour and tone to existing exposed rock in the surrounding landscape. Borrow pits used for construction of the Proposed Development would be reinstated to minimise visual effects in the long term. It is envisaged that borrow pit reinstatement would involve reprofiling to minimise the appearance of cut faces, and provide a more natural appearing landform, and replacement of the vegetated peat layer.

Other Structures

Other structures required for the Proposed Development comprise the substation and welfare buildings and LiDAR stations which would be set in fenced compounds.



The substation would be accommodated on a levelled platform located in a central position within the western cluster of the Proposed Development. The site selected is considered to be a suitable location for this facility:

- The central location of the site is easily accessible and provides good opportunity for buried cable connections to all wind turbines;
- The area avoids deep peat, is over 50m from any watercourses and of a relatively even gradient, reducing requirements for cut and fill and the generation of excess peat;
- The area provides sufficient space to accommodate all the required facilities; and
- The area is set fairly low down within the 'bowl' of the plateau, thus reducing wider landscape and visual effects.

Due to the altitude, it is likely that most substation equipment would be accommodated within buildings. Up to three buildings are envisaged on the substation platform accommodating substation equipment and operations and welfare facilities. The clustering of required buildings in one location would help to localise the visual effects associated with these structures and avoid a scattering of smaller scale infrastructure, which can increase the perceived scale of the wind turbines. Accommodation of these facilities at a single site would also contain activities during the operational phase, avoiding unnecessary transportation around the wider wind farm site.

Buildings would be constructed with a profiled steel cladding. Colour studies have been carried out to determine the most favourable colour choice for the buildings.

Various greens and browns were considered during the process. Whilst greens appear to reflect the natural colours in the landscape at some times of year, during the autumn and winter months a green building has a higher chance of strongly contrasting with its surroundings. A dark brown is considered more consistently reflective of colour changes throughout the changing seasons in this area.

Van Dyke brown is therefore suggested as most appropriate because it matches well with a number of the existing colours seen in the landscape and is also likely to suit brighter conditions, when light contrast is higher and shadows are stronger. A softer brown, such as Coffee / Bison, would not react so well in these conditions. The existing substation buildings of Stronelairg Wind Farm are also Van Dyke brown and the use of this colour for the Proposed Development would therefore give consistency across the wider site.



In summer, subtle shades of green and brown are more prominent within the landscape, with the more distant hills seen as a hazy grey-green. Shadows and peat hags form patches of darker brown. There is little bare rock visible and the lighter colour of the access track contrasts with the darker tones of the moorland.

Whilst the greens within the grassy areas of moorland may more readily be represented by Dark Laurel / Tundra and Spruce Green, the darker tones of Van Dyke brown also complement the areas of shadow.

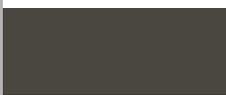
Proposed Development site, July 2019



In autumn / winter, the grasses have turned to pale yellow, and dark and reddish browns are the more prominent colours of the moorland, fading to hazy browns and blues in the distance. The natural stone of the track continues to contrast with the darker tones of the moorland.

A building in green would be more out of place in this landscape. Whilst the reddish tones of the moorland are similar to Coffee / Bison, the darker brown of Van Dyke brown is present in the areas of shadow and peat and compliments all the colours of the landscape.

Proposed Development Site, November 2014



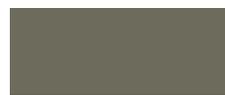
VAN DYKE BROWN / IRONSTONE



DARK LAURAL / TUNDRA / SHERWOOD



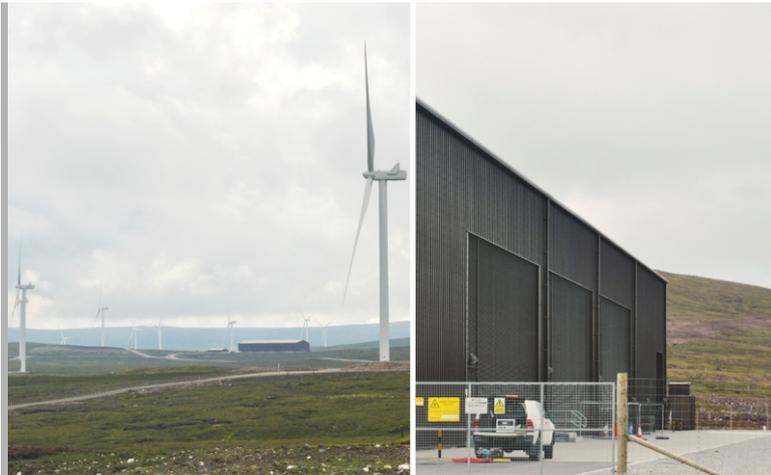
COFFEE / BISON



SPRUCE GREEN / THYME / CHIVE



NATURAL STONE



Buildings would be constructed with a profiled steel cladding and would be likely to appear similar to those for the Stronelairg substation. It is proposed that cladding would be coloured Van Dyke brown, the same colour used for the Stronelairg buildings.

The main Stronelairg substation building: in wider context and detail

Where possible, the detailed design would seek to 'design out' fencing which can lead to an additional human scale element, emphasising the scale of substation buildings and wind turbines and forming a more cluttered appearance. However, fencing would be required around LiDAR stations and some substation components. Where practicable, a post and wire construction would be used in favour of steel palisade. However, for safety and security reasons the use of 2.5m steel palisade fencing would be required in some locations. Where possible, consideration would be given to colouring the fencing a similar dark brown shade to the substation buildings to minimise its visual appearance.



The dark brown colour of the fencing, the same as the building, helps to provide continuity and reduces the effect that fencing can have of increasing the perceived development footprint and cluttered appearance.

Melgarve substation

SECTION 4. ACCESS CONSIDERATIONS

Access Tracks

The location of the Proposed Development adjacent to the existing developments of Stronelairg Wind Farm and Glendoe Hydroelectric Scheme enables some of the existing access infrastructure to be used. Access for the construction and operation of the site would be from the B862 via the existing track initially built as part of the Glendoe Hydroelectric Scheme but upgraded and modified more recently during the construction of Stronelairg Wind Farm. Other existing access tracks would be used where practicable with new tracks constructed to access individual turbines as detailed in Section 3.

The constructed access tracks would provide access to all turbine positions and to the substation and LiDAR stations. During construction of the Proposed Development, there would be some restrictions to public access to parts of the site for health and safety reasons. However, during operation, the tracks would be accessible to members of the public for non-motorised recreation in line with the Draft Outdoor Access Management Plan (Technical Appendix 15.1 of the EIA Report).

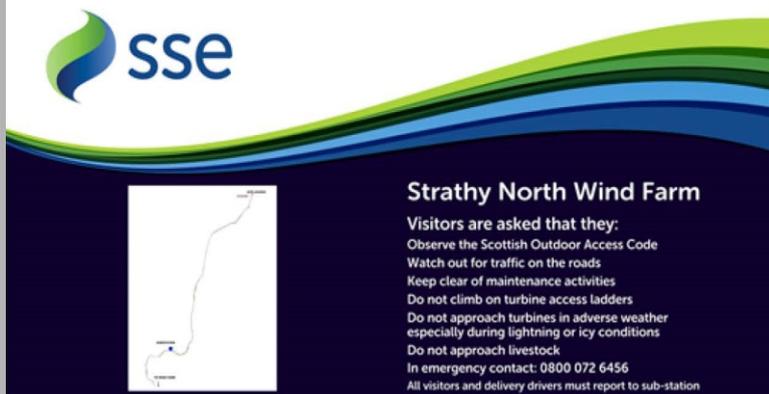


Access to the site from the B862 would be via the existing track which provides access to Glendoe Hydroelectric Scheme and Stronelairg Wind Farm. Existing tracks are typically built to a high standard capable of accommodating construction vehicles and large wind turbine deliveries.

Existing Stronelairg and Glendoe Access Track during construction of Stronelairg Wind Farm

Signage would be put in place for the lifetime of the wind farm to highlight to the public the potential safety issues of accessing the site during adverse weather (e.g. ice throw and lightning etc.) and ongoing Estate activities (shooting etc.). These are already in place at the site entrance for the operational Stronelairg Wind Farm but would also be placed where existing walking routes intersect with the Proposed Development.

The access tracks for the Proposed Development would be suitable for use by emergency vehicles. Helipads are already present on the existing Stronelairg / Glendoe sites for use in emergency situations.



Example of the type of signage which would be installed to inform the public during the operational lifetime of the Proposed Development.

Example of access signage

Pedestrian Access to Buildings

For health and safety reasons, access to the on-site buildings would be restricted to persons who are specifically authorised to enter these facilities. In accordance with the Electricity Safety, Quality and Continuity Regulations 2002, the substation buildings and facilities would be contained within either secured buildings or security fenced compounds.

There would not be any restriction of access to other parts of the site unless maintenance works required a temporary secure area for health and safety reasons.

Ramped accesses to the substation buildings would be provided to assist with the safe installation of, and future maintenance of the equipment. The welfare and control building would be provided with suitable disabled access and parking facilities in line with building regulations.

The detailed layout of the substation would be designed to ensure that access is possible to all equipment for maintenance or emergency repair.