Chapter 2 Site Selection & Design Iteration

Contents

2.1 Executive Summary 3
2.2 Introduction 3
2.3 Site Location, Site Selection & Consideration of Alternatives 3
2.4 Design Process 5
2.5 Design Iterations 7
2.6 Do-Nothing-Scenario 8
2.7 Summary 8
2.8 References 9

List of Abbreviations

Abbreviation	Description
AOD	Above Ordnance Datum
CNP	Cairngorms National Park
EIA	Environmental Impact Assessment
GIS	Geographical Information System
Ha	Hectare
HES	Historic Environment Scotland
kV	kilovolts
LVIA	Landscape and Visual Impact Assessment
MOD	Ministry of Defence
NATS	National Air Traffic Service
OS	Ordnance Survey
PAN	Planning Advice Note
SLA	Special Landscape Area
SM	Scheduled Monument
SPP	Scottish Planning Policy
THC	The Highland Council
TTA	Tactical Training Area
SLA	Special Landscape Area
WLA	Wild Land Area

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2. Site Selection & Design Iteration

2.1 Executive Summary

2.1.1 This chapter outlines the process undertaken in selecting the site as a potential location for a wind energy development, provides a description of the site and surrounding area, and discusses the design evolution process undertaken by the Applicant prior to arriving at the final Proposed Development design.

2.2 Introduction

2.2.1 Environmental Impact Assessment (EIA) legislation requires the consideration of alternatives and an indication of the reasons for selecting the site, except where limited by constraints of commercial confidentiality.

2.2.2 A key benefit of the EIA process is the opportunity it gives to integrate technical and environmental considerations into the careful, iterative design of a development. This allows potential environmental effects to be considered and minimised so that the environment is considered within the Proposed Development design layout from the earliest stage.

2.2.3 The final design of the Proposed Development represented in this EIA Report was arrived at following iterative consideration of many alternative design configurations. This chapter describes the design iteration process from which the Proposed Development design was selected.

2.2.4 The final design for the Proposed Development is described in **Chapter 3: Project Description** and is shown on **Figure 1.2**.

2.3 Site Location, Site Selection & Consideration of Alternatives

Site Location

2.3.1 The Proposed Development is located approximately 10 km north-west of Grantown-on-Spey and 14 km east of Tomatin in the Scottish Highlands.

2.3.2 The site comprises an area of approximately 1,458 hectares (ha) of land and varies in topography from 290 m Above Ordnance Datum (AOD) in the northern section of the site to 460 m AOD in the southern section of the site.

2.3.3 The site is located in an area of open moorland, bounded to the east by the B9007 and to the west by the Leonach Burn. A number of tributaries to the Tomlachlan Burn intersect the site, with the Tomlachlan Burn running south to north through the centre of the site.

2.3.4 There is one scheduled monument (SM) within the site itself and a further seven within 5 km of the site boundary, including Lochindorb Castle (SM 1231) to the east. The site sits approximately 1.1 km north of the Cairngorm National Park (CNP) and is within the boundary of the Drynachan, Lochindorb and Dava Moors Special Landscape Area (SLA). It is also within 20 km of two Wild Land Areas (WLA); 20 – Monadhliath and 15 – Cairngorms.

2.3.5 In identifying a suitable site, the following technical and environmental factors that influence the feasibility of a potential wind energy development were taken into account:

- Strong wind resource;
- Suitable terrain and topography;
- Access to the electricity grid system;
- Feasibility of access by abnormal loads;
- Visibility within sensitive areas;

- Residential properties in close proximity;
- International or national statutory designations for landscape or nature conservation within or in close proximity to the site;
- Appropriate ground conditions; and
- Cumulative effects with other wind farm developments.

2.3.6 The Proposed Development site is considered an appropriate and viable location for a wind energy project due to its:

- Remoteness from communities;
- Good average wind speeds and generation capacity;
- Ability to re-use existing wind energy infrastructure as well as on-site access tracks, with some minor upgrading;
- Positively contribute to regional and national renewable energy and carbon reduction targets; and
- Provision of real social and economic benefits to the local area.

Site Selection

2.3.7 The Applicant is engaged in a continual search and assessment of potential wind farm sites throughout the UK to progress and develop into wind farm applications. This search began in the mid 1990's and the process has yielded a number of sites which have progressed to operational wind farms.

2.3.8 The search process involves an initial desk-based assessment being undertaken to identify potential areas for wind farm development and makes use of the following resources:

- The Ministry of Defence (MoD) low flying area maps and Tactical Training Area (TTA) maps;
- National Air Traffic Services (NATS) safeguarding maps;
- National Grid network operators' distribution and transmission maps for the 33 kilovolt (kV) and 132 kV network;
- *Scottish Planning Policy* (SPP) with particular regard to Renewable Energy, paragraphs 182-186;
- Maps of existing and planned regional and national designated areas for landscape, ecology and wildlife and archaeological sites;
- Up-to-date and emerging Development Plans;
- Location maps of existing and proposed wind farms;
- 1:50,000, 1:25,000 and 1:10,000 Ordnance Survey (OS) maps and contour data; and
- '*Spatial Planning for Onshore Wind Turbines – Natural Heritage Considerations*' (updated in June 2015).

2.3.9 Following initial studies, areas are either selected for further examination or rejected as unsuitable. This process has identified a large number of sites throughout Scotland as potentially suitable for further investigation and potential development.

2.3.10 Sites are then assessed against a list of selection criteria including those mentioned at **paragraph 2.3.5** above. Any site failing to meet this selection criteria or which conflicts with the criteria in a way that cannot be successfully resolved is removed from the site selection process. The next step would be to further review the remaining potential sites and investigate which have the most potential for development.

2.3.11 The cumulative impact of wind farms is an increasingly important consideration for all wind development in Scotland. Information is gathered on all wind farm proposals within a 45 km radius of the site. The planning history of wind farm applications in the vicinity of the site are

also studied to examine the planning sensitivities and any precedents set for each proposed site.

2.3.12 If sites are considered to be environmentally unacceptable and mitigation solutions will not resolve any adverse negative impacts, then these sites are eliminated along with any others which are rendered uneconomically viable to develop.

2.3.13 The overall selection process of an appropriately located wind farm site is lengthy, with the vast majority of sites being deemed unsuitable or too greatly constrained to develop. Even when a suitable site has been found, issues may arise during the course of the project's development, which can undermine the scheme.

Consideration of Alternatives

2.3.14 *Paragraph 5(2)(d)* of *The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017* requires that the EIAR includes a description of reasonable alternatives studied by the developer, which are relevant to the development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment. As noted in *Planning Advice Note (PAN) 1/2013*, "*Whilst the Directive and the Regulations do not expressly require the applicant to study alternatives, those alternatives which are in any case considered as part of the project planning and design process must be assessed, and an outline of the main alternatives studied by the applicant included in the EIA Report. The EIA Report must also give an indication of the main reasons for the choice made, taking into account the environmental effects*".

2.3.15 As described in **section 2.5** below, the Applicant has considered a number of alternative turbine layouts for the Proposed Development. The finalised layout is the seventh iteration of the Proposed Development.

2.3.16 As for other sites entirely, as mentioned previously, the Applicant has an ongoing search for potential onshore wind farm sites. This involves a desk-based assessment utilising secondary data and a Geographical Information System (GIS) to identify constraints at a particular site. Sites that are not deemed suitable at one given time (i.e. 'the alternatives') may at a later date be re-assessed against the resources listed in **paragraph 2.3.8**, as well as up to date planning policy. Hence, for commercial reasons and in accordance with *PAN 1/2013*, it is not possible to disclose the names or positions of the alternative sites.

2.4 Design Process

Design Principles

2.4.1 Current best practice guidance provides a framework for the consideration of key design issues including turbine size, layout composition, wind farm design in relation to landscape character and designing for multiple wind farms (SNH, 2017).

2.4.2 The following principles were adopted during the design iterations made by the Applicant to ensure that the final design of the Proposed Development was the most suitable for the site:

- Avoid inconsistent turbine spacing, such as relatively large gaps, outliers or excessive overlapping turbines to minimise visual confusion and ensure a balanced / compact array from key views.
- Minimise effects on the Cairngorms National Park (CNP) as far as possible.
- Limit turbines within the far eastern extents of the site, away from the B9007 and Lochindorb.
- Consider the position of existing and consented wind farm developments in the local area from key views.

- Consider how to utilise the existing topography to reduce the visual impacts of the development from key views.
- Avoid of areas of deep peat wherever possible.
- Location of watercourses and ground conditions/topography.
- Create a scheme which maximises the potential of the site to generate renewable energy.
- Use of existing infrastructure as far as practicably possible.
- Respect other environmental and technical constraints and associated buffers.

2.4.3 The above factors were carefully evaluated, as evidenced by from the number of design iterations of the proposed site. Seven iterations were proposed and assessed before the final design was produced.

Turbine Scale

2.4.4 Onshore wind continues to be one of the cheapest forms of renewable energy; however, larger turbines must be considered if onshore wind development is to continue to contribute to both the UK and Scottish Government's renewable energy targets. The supply of smaller turbines across Europe is reducing due to lack of demand as manufacturers are recognising the world market is shifting to larger machines and are focussing their development work on larger turbines which secure the highest yield. The onshore wind industry has experienced a reduction in supply of smaller wind turbines due to lack of demand from mainland Europe, where the tendency is to install wind turbines at higher tip heights (175 to 240 m to blade tip). Therefore, it is highly unlikely that a range of smaller turbines would be available at competitive prices by the time the Proposed Development is ready to be constructed, should it be consented.

2.4.5 The Applicant's professional advisors produced and reviewed the preliminary wireframes and analysed the landscape capacity of the Proposed Development site, in order to advise on the most appropriate design to maximise renewable energy generation from the site while not resulting in unacceptable landscape and visual effects.

2.4.6 For these reasons, the Applicant elected to proceed with the Proposed Development with a maximum tip height of 185 m.

Constraint Identification and Mapping

2.4.7 The design of any development is driven by the key objective of positioning turbines so that they capture the maximum energy possible within a suitable area further informed by environmental and technical constraints

2.4.8 It is important to note that the identification of a constraint does not necessarily result in the exclusion of that area from the potential development envelope; rather it means that careful thought and attention was paid to the constraint and the design altered appropriately.

2.4.9 The key constraints which were considered during the development process included:

- topography;
- presence of ornithology;
- protected habitats and species;
- ground conditions (including peat);
- presence of watercourses;
- presence of cultural heritage features;
- aviation; and
- telecommunications links.

2.4.10 The known environmental and technical constraints within the site were formed part of early-stage constraints mapping which went onto inform the final design of Proposed Development. The constraints identified are shown on **Figure 2.1**.

2.5 Design Iterations

Turbines

2.5.1 The Applicant has considered a number of alternative turbine layouts for the Proposed Development. The finalised layout is the seventh iteration of the Proposed Development. The layout of the Proposed Development has been an iterative process which started early in 2020, each time taking into consideration information gathered at the site or comments from consultees, as well as the professional judgement of technical experts.

2.5.2 The initial layout (referred to as "Layout A") was developed with 36 turbines to maximise yield and capacity against initial onsite constraints identified through a desk study and site surveys including Stage 1 peat depth survey and Phase 1 Habitat Survey, as shown on **Figure 2.2**.

2.5.3 Layout B was developed from the initial Layout A and took into consideration wind resource, the surrounding topography, access and landscape, which saw turbines along the eastern site boundary removed to minimise views from the CNP and Lochindorb Castle. Layout B, comprising 23 turbines, is shown on **Figure 2.2**.

2.5.4 Layout C was used to inform the Scoping Report and took into account the findings of further environmental surveys. It also sought to make additional improvements to views from the CNP by moving the southernmost turbines within the array northwards. T14 and T20 were removed to reduce the width of the array from the CNP, and T05 was removed to minimise views from the B9007. The 20 turbines within Layout C are shown on **Figure 2.3**.

2.5.5 Layout D was the result of the micrositing of several turbines to further minimise landscape and visual effects, including in the CNP. T17, T18 and T20 were relocated north to make improvements to the view from Alltlaoigh Farmstead cultural heritage asset. In response to ongoing consultation with Historic Environment Scotland (HES), T01 and T17 were also microsited to reduce the spread of turbines visible from cultural heritage receptors to the north (Dunearn Fort and Ardclach Bell Tower), as shown on **Figure 2.3**. Layout D also developed a preliminary infrastructure layout for the 20-turbines and is also shown on **Figure 2.3**.

2.5.6 Layout E saw T08 removed following a site visit by the project engineer and in consultation with the EIA technical team. Turbines were subsequently renumbered T01-19, as shown on **Figure 2.4**.

2.5.7 Layout F was developed following the receipt of a wind farm interference analysis report from Airwave Solutions which detailed the presence of two Airwave MW Radio links within the site. A subsequent detailed design review was undertaken, in consultation with Airwave Solutions, to produce a layout that did not interfere with the links. The constraints necessitated the removal of a further turbine. Layout F, comprising 18 turbines, is shown on **Figure 2.4**.

2.5.8 Layout G was a further refinement to the layout through the removal of T01 in order to minimise effects on ecological, geological features and to provide a visually balanced composition of turbines from key landscape and heritage viewpoints. Turbines were renumbered T01-18 and the resulting final layout taken forward to application. It is shown in **Figure 2.5** and described in further detail within **Chapter 3: Project Description**.

Infrastructure

Tracks

2.5.9 The site benefits from existing access direct from the B9007, used as the site entrance to the operational Tom nan Clach Wind Farm. The Applicant has therefore sought to use the existing infrastructure as part of the development layout where feasible. Proposed new tracks have been designed to take into account existing site topography, ground conditions including peat depth, and to minimise and appropriately locate water crossings. Comments from consultees, such as SEPA, were also taken into consideration and the layout amended to incorporate their suggested changes (refer to **Appendix 4.4**).

Borrow Pit Search Areas

2.5.10 Borrow pits are required as a source of rock to be used in the construction of the tracks, hardstandings and foundations. Potential locations for the borrow pits were identified based upon a review of geological mapping and site reconnaissance. The total number and size of borrow pit search areas was selected to meet the estimated volume of rock required to construct the tracks, crane hardstands and foundations.

2.5.11 If the Proposed Development is consented, further intrusive geotechnical investigation would be carried out at the three borrow pit locations to establish whether they would yield the required quality of rock for each aspect of the infrastructure.

Compounds

2.5.12 The location of the construction compounds and substation and energy storage facility are shown on **Figure 1.2**. These have also been considered through the iterative design process and have been sited to avoid watercourses, areas of deep peat and to minimise impacts on sensitive habitats. The northern construction compound has also been located for practical purposes; to control traffic entering the main body of the site, to be located close to the wind turbines and to facilitate construction of the substation and energy storage facility.

2.6 Do-Nothing-Scenario

2.6.1 Should the Proposed Development as described in **Chapter 3: Project Description** not be consented (the “do-nothing scenario”), it is anticipated that the Proposed Development site will not alter from the current baseline described above and in **Chapters 6** to **15**.

2.7 Summary

2.7.1 The final Proposed Development layout has been informed by a robust design iteration process, taking into account potential environmental, landscape and visual impacts and their effects, physical constraints, and health and safety considerations. The information used to inform the design iteration process included baseline data, review of preliminary visualisations, ongoing impact assessments and wind yield optimisation.

2.7.2 The final turbine layout and scale has been designed to maximise renewable energy generation from the site, whilst keeping within acceptable limits for potential impacts on the environment.

2.7.3 The EIA Report is based on the final layout selected for the Proposed Development. The final layout comprises 17 turbines up to 185 m in height and associated access tracks, crane hardstandings, substation, control room and energy storage facility, construction compounds and borrow pit search area. The final layout of the Proposed Development is described in detail in **Chapter 3: Project Description** and shown on **Figure 1.2**.

2.8 References

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