Technical Appendix 7.1: Methodology for the LVIA

Contents

1.0 Introduction

The landscape and visual impact assessment (LVIA) considers:

- effects during construction and operation on the landscape character of the site and the surrounding study area;
- effects during operation on views across the study area towards the site, including views from key viewpoint locations agreed through consultation, from settlements, and as part of sequential experiences along routes, including those used by recreational receptors;
- cumulative effects on landscape character and views should other consented or in-planning wind farm sites be present in the future; and
- the implications of landscape and visual effects on the special qualities and integrity of designated landscapes.

This assessment is carried out in accordance with the principles contained within the following documents:

- Guidelines for Landscape and Visual Impact Assessment (referred to hereafter as GLVIA3).
- Siting and Designing Windfarms in the Landscape (SNH, 2017).
- Assessing the Cumulative Landscape and Visual Impact of Onshore Developments (NatureScot, 2021).

2.0 Scope of the Assessment

2.1 Study Area

NatureScot guidance (SNH, 2017) suggests that for turbines of over 150 m to blade tip, an initial study area of 45 km radius should be considered, followed by refinement of the study area to focus on potential significant effects. The ZTV to 45 km is shown on Figure 7.1. The study area was reduced to allow reporting to focus on the extent of likely significant effects, following fieldwork, analysis of the ZTV and assessment. Visual effects were considered for locations across the wider area, but those reported on in detail are within an area of approximately 25 km radius for viewpoints and routes, and approximately 10 km radius for settlements. Effects on landscape character were also considered for a wider area, but the assessment focusses on those within approximately 10-15 km radius where significant effects were found to be more likely.

An assessment of effects on visual aspects of residential visual amenity at nearby properties was limited to properties within 2-2.5 km of the Proposed Development. The Landscape Institute Guidance (LI, 2019) states that for wind turbines 1.5-2 km radius may be appropriate. As the proposed turbines are to 200 m to blade tip, this has been extended to 2.5 km to ensure that all potentially affected properties are considered.

2.2 Elements Scoped Out of Assessment

To allow focussing of the assessment, an initial scoping exercise was carried out to identify where receptors are unlikely to be affected by the Proposed Development, either through having little or no theoretical visibility, or being distant from the Proposed Development. These receptors have been scoped out of the LVIA. In addition to this, the scope of reporting was further focussed on those effects that were found to be significant or contribute to the meaningful discussion of material landscape and visual effects of the Proposed Development.

Scoped out of the LVIA, on the basis of field work, ZTV coverage and initial assessment, are the following elements:

- Effects on landscape character beyond approximately 15 km.
- Effects on views from viewpoints beyond approximately 25 km, although there will be locations where the Proposed Development will be visible at greater distances.

- Effects on views from routes beyond approximately 25 km.
- Effects on views from local paths beyond approximately 10 km.
- Effects on views from settlements beyond approximately 10 km.
- Effects on designated landscapes beyond approximately 25 km.
- Cumulative effects with turbines of less than 50 m to blade tip.
- Visual effects of aviation lighting beyond approximately 20 km.
- Effects on landscape character after dark. During the times when the lights will be on, the perception of the character of the landscape is reduced to nothing in the darkness, such that whilst the lighting may be seen in views when the outlines of landforms and horizons will still be visible, the likelihood of significant effects on the perception of landscape character decreases rapidly with the onset of darkness. As such, an assessment of effects of aviation lighting on landscape character has been scoped out.

Viewpoint selection was also a form of containing the scope of the assessment, through the selection of representative viewpoints, rather than exhaustive inclusion of locations within the ZTV. The selection of viewpoints for use in the assessment was the subject of consultation with statutory consultees.

2.3 Baseline Methodology

Desk studies were undertaken to provide information about the baseline landscape and visual resources and to inform fieldwork and the evaluation of effects. For this work, data sources included Ordnance Survey (OS) topographic and geological maps, as well as references specific to landscape character (NatureScot Scottish Landscape Character Assessment), designated areas (e.g. local planning documents).

Field survey work was carried out during several visits under differing weather conditions, between September 2022 and April 2024. Records were made in the form of field notes and photographs. Field survey work included visits to viewpoints and designated landscapes, and extensive travel around the wider study area to consider potential effects on landscape character and on experiences of more distant views and routes.

3.0 Assessment Structure

Consideration of potential effects on landscape and visual amenity are related but distinct components of LVIA[1]. The methodologies used to assess potential landscape and visual effects are broadly similar, but in order that the differences are clear, the methodologies for assessing significance for landscape and visual effects, and the assessment sections themselves, are set out separately.

The LVIA considers the potential effects of the addition of the Proposed Development to the existing landscape, against a baseline that includes existing wind farms (and those under construction). The cumulative landscape and visual impact assessment (CLVIA), considers the potential changes in effects with the addition of the Proposed Development, relating to a baseline landscape that includes wind farms that may or may not be present in the landscape in the future (e.g. consented schemes that have not yet been built, schemes which are currently undetermined applications).

The operational phase elements of the Proposed Development, i.e. turbines (with aviation lights), tracks, battery energy storage system (BESS), substation and other infrastructure, are considered to be long-term elements as they will be in situ for the 50 year operational life of the Proposed Development. They are reversible upon decommissioning. This is taken to be the case for all effects but is not repeated for each receptor.

Using a precautionary approach, unless otherwise stated, all likely effects identified are considered to be adverse.

The assessment is based on a candidate turbine specification, with an awareness that there may be hub height or rotor diameter changes within the parameters of the application, depending on the turbine model selected at the time of construction.

3.1 Identification of Landscape Effects

Judging the significance of landscape effects requires consideration of the nature of the landscape receptors (sensitivity) and the nature of the effect on those receptors (magnitude of change). GLVIA3

[1] This distinction is emphasised and clearly defined in GLVIA3.

states that the nature of landscape receptors, commonly referred to as their sensitivity, should be assessed in terms of the susceptibility of the receptor to the type of change proposed, and the value attached to the receptor. The nature of the change on each landscape receptor should be assessed in terms of its size and scale, geographical extent, duration and reversibility. These aspects are brought together, to form a judgement regarding the overall significance of effect. The following sections set out the methodology used to evaluate landscape effects.

Sensitivity of Landscape Receptors

The sensitivity (or 'nature') of landscape receptors is assessed in terms of the susceptibility of the receptor to the type of change proposed and the value attached to the receptor.

The susceptibility of the landscape relates to "*the ability of the landscape receptor (whether it be the overall character or quality/condition of a particular type or area, or an individual element and/or feature, or a particular aesthetic and perceptual aspect) to accommodate the Proposed Development without undue*[2] *consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies*" (GLVIA3, Page 88).

Criteria that inform judgements of landscape susceptibility to the type of development being proposed include:

- landscape scale;
- landform;
- skylines;
- pattern and complexity;
- inter-visibility with adjacent landscapes;
- settlement and man-made influences; and
- perceptual influences.

The value of a landscape is recognised as being a key contributing factor to the sensitivity of landscape receptors. Value is informed with reference to:

- A review of designations upon the landscape and the level of policy importance that they signify (such as landscapes designated at international, national, local or community level).
- Other criteria that indicate value, including landscape quality, scenic quality, rarity, representativeness, conservation interests, recreation value, perceptual aspects, and artistic associations.

It should be noted that whilst landscape designations at an international or national level are likely to be accorded the highest value, it does not necessarily follow that all such landscapes have a high susceptibility to all types of change, and conversely, undesignated landscapes may also have high value and susceptibility to change. There may be a complex relationship between the value attached to a landscape and its susceptibility to change. Therefore, the rationale for judgements on the sensitivity of the landscape needs to be clearly set out for each receptor.

Judgements of relative sensitivity of different Landscape Character Types (LCTs) to wind farm development also have cognisance of other assessments of landscape character and sensitivity. The analysis provided in Scottish Borders Council Supplementary Guidance, Renewable Energy (SBC, 2018) is focussed on landscape 'capacity'. 'Capacity' is considered by NatureScot no longer to be an appropriate approach to considering the landscape resource, although these studies contain information relevant to relative sensitivity.

Sensitivity of the receptor is a consideration of susceptibility to change and value, and is described using 'high', 'medium' and 'low'. It is based on an evaluation of criteria such as those set out in the tables below, using professional judgement to balance several factors that may raise or lower the level of sensitivity. 'High' is assigned to a receptor that meets all or most of the criteria indicating higher sensitivity, or where one or more criteria are considered to be sufficiently important to outweigh other 'lower' criteria. 'Low' is assigned to receptors where criteria fall into the lower part of the scale. 'Medium' is assigned to receptors where criteria are mixed or of intermediate sensitivity.

[2] Undue can be interpreted as 'disproportionate'.

Table 1 – Sensitivity of the Receptor: Landscape

Criteria tending towards Higher or Lower Sensitivity		
	Higher ⟷	Lower
Susceptibility to Change	– Contains features vulnerable to change or loss that would in turn alter key landscape characteristics. – Complex, rugged, irregular landform with strong topographical features and distinctive skylines. – Few modern artefacts present, presence of small scale, historic or vernacular settlement. – Remote from visible or audible signs of human activity and development.	– Robust landscape, with few or no vulnerable features, and potentially able to accommodate particular types of change without altering landscape characteristics. – Simple, regular landform without strong topographical features, non-prominent or screened skylines. – Presence of large scale structures e.g. utility, infrastructure or industrial elements. – Close to visible or audible signs of human activity and development.
Value	– Relatively rare or 'unique' LCT. – Designated landscape with national policy level protection.	– Ubiquitous or extensive landscape type. – A landscape without formal designation[3].

Magnitude of Landscape Change

Judgements regarding the magnitude of landscape change consider the size, scale, and geographical extent of the landscape effect, and its duration and reversibility.

For landscape elements/features, the size and scale of change depends on the extent of existing landscape elements that will be lost or changed, the proportion of the total extent that this represents (i.e. rarity) and the contribution of that element to the character of the landscape. For LCTs, the size and scale of change depends on the degree to which the character of the landscape is changed through alteration to the key characteristics of the landscape.

Given that wind farms currently exist in the study area, the scale and size of change also considers the relationship between the Proposed Development and other wind farms in the landscape, including consideration of:

- the arrangement of wind farms in the landscape, e.g. developments that are clustered or dispersed;
- the position of the wind farms in the landscape, e.g. in similar landscape or topographical contexts;
- the distances between wind farms, and their distances from the viewer;
- the relative perceived scales of the wind farms in the landscape; and
- how the Proposed Development fits with the pattern of wind farm development in the baseline, and whether it intensifies the presence of wind farms or fills a gap, leading to a total effect that is greater than the sum of its parts, e.g. creating a 'wind farm landscape'.

The geographical extent of landscape change is the area over which the landscape change being described will occur. Geographical extent is described as being limited to the Proposed Development site, to the local area, or a wider area, which is defined in each case.

Size/scale, geographical extent and duration/reversibility (assumed to be long term theoretically reversible for operational effects as explained above) are combined to form a judgement as to the overall magnitude (nature) of the landscape change, recorded as 'high', 'medium', 'low' or 'negligible'.

Magnitude of change is described using criteria such as those set out in Table 2, using professional judgement to balance several factors that may raise or lower the magnitude judgement. 'High' is assigned to a change that meets the criteria indicating higher changes, or where one or more criteria are considered to be sufficiently important to outweigh other 'lower' criteria. 'Low' or 'negligible' is assigned to receptors where criteria fall into the lower part of the scale, 'medium' is assigned to receptors where criteria are mixed or of intermediate levels.

[3] Note that as stated in the Council of Europe Landscape Convention (2000), all landscapes have value.

Table 2 – Magnitude of Change to the Landscape

Criteria tending towards Higher or Lower Magnitude of Change		
	Higher ⟷	Lower
Scale	– Large changes or extensive loss of key features	– Small changes to key features, little or no loss of features
Geographical Extent	– Large areas affected by change – Changes perceived as close to the receptor	– Limited area affected – Changes perceived as distant from receptor

Judging the Levels of Landscape Effect and Significance

In judging significance, sensitivity of receptors has to be considered in combination with predicted magnitude of change. As set out above, sensitivity and magnitude are evaluated by considering a range of aspects. Considering all aspects in a multifaceted assessment and assigning more or less weight to individual aspects as appropriate, the overall level of effect is identified. This assessment of the level of effect draws on field work, consultation and guidance provided in GLVIA3. It does not use a matrix or scoring of sensitivity against magnitude of change, an approach which is not supported by GLVIA3.

Four levels of effect are used in this assessment: **major**, **moderate**, **minor** and **negligible**. Effects that are significant in the context of EIA Regulations include major and moderate effects.

Table 3 sets out various criteria and descriptions that are used to guide judgments as to the level of effect.

Table 3 – Levels of Effect: Effects

<table>
<tr><th colspan="4">Criteria tending towards Higher or Lower Effect</th></tr>
<tr><th>Major</th><th>Moderate</th><th>Minor</th><th>Negligible</th></tr>
<tr><td colspan="2">HIGHER LEVEL OF EFFECT
Effects on people who may be particularly sensitive to changes in views/ visual amenity, or at recognised viewpoints or from recognised scenic routes.
Large scale changes which introduce new, non-characteristic or discordant or intrusive elements into the view.
These may be long term/ irreversible effects.</td><td colspan="2">LOWER LEVEL OF EFFECT
Effects on people who are generally less sensitive to changes in views/ visual amenity.
Small changes or changes which are well integrated into the view, often involving features already present in the view.
These may be reversible effects or of short duration.</td></tr>
<tr><td colspan="2">Significant</td><td colspan="2">Not Significant</td></tr>
<tr><td>Substantial changes affecting the character of the landscape or the elements therein.</td><td>Changes affecting the character of the landscape or the elements therein.</td><td>Slight changes affecting the character of the landscape or specific elements therein.</td><td>No or minimal perceptible changes affecting the character of the landscape or specific elements therein. Note that this includes no effect.</td></tr>
</table>

3.2 Identification of Visual Effects

Visual effects are experienced by people at different locations around the study area, at static locations (for example settlements or viewpoints) and transitional locations (such as sequential views from routes). Visual receptors are the people who will be affected by changes in views at these places.

Sensitivity of Visual Receptors or Views

People will have individual responses to changes in the view which relate to their relationship to the landscape and how they value it. In order to make a reasoned and independent judgment of likely responses to the changes, sensitivity is considered in terms of susceptibility and value.

The susceptibility of visual receptors to changes in views/visual amenity is taken as a function of the occupation or activity of people experiencing the view and the extent to which their attention is focused

on views (GLVIA3, page 113). Viewers of higher susceptibility to changes in views are those whose attention or interest is focused on their surroundings, including:

- Residents, for whom views contribute to the landscape setting enjoyed at their homes.
- People engaged in outdoor recreation (including users of public rights of way) whose interest is likely to be focused on the landscape.
- Visitors to heritage assets, advertised viewpoints or other attractions where views of the surroundings are an important contributor to experience.

Viewers of lower susceptibility to changes in views include travellers on road, rail or transport routes (not recognised as scenic routes); people engaged in outdoor sport or recreation which does not involve or depend upon appreciation of views; and people at their place of work whose attention is not on their surroundings.

Recognition of the value of a view is considered with reference to:

- Planning designations (such as designated landscapes at a local or national level).
- Importance in relation to heritage assets (such as designed views recorded in citations of designated landscapes or views recorded as of importance in Conservation Area Appraisals).
- Indicators of the value attached to views by visitors, for example through appearances in guide books or on tourist maps, and references to them in literature and art.
- Provision of facilities for the enjoyment of the view (such as benches on which to sit and spend time looking at the view).

The sensitivity of views and visual receptors may involve a complex relationship between a viewer's susceptibility to change and the value attached to a view. The rationale for judgements of sensitivity of visual receptors are set out for each receptor in relation to both susceptibility and value.

Susceptibility and value are combined to form a judgement as the overall sensitivity of the visual receptor, recorded as 'high', 'medium' and 'low'. It is based on an evaluation of criteria such as those set out in the tables below, using professional judgement to balance several factors that may raise or lower the level of sensitivity.

'High' is assigned to a receptor that meets all or most of the criteria indicating higher sensitivity, or where one or more criteria are considered to be sufficiently important to outweigh other 'lower' criteria.

'Low' is assigned to receptors where criteria fall into the lower part of the scale. 'Medium' is assigned to receptors where criteria are mixed or of intermediate sensitivity.

Table 4 – Sensitivity of the Receptor: Visual

Criteria tending towards Higher or Lower Sensitivity		
	Higher ⟷	Lower
Susceptibility to Change	– Residents. – People engaged in outdoor recreation such as walkers. – Tourists on scenic routes and visitors to heritage assets or advertised viewpoints.	– Road users, or those on transport routes (not scenic routes). – People whose outdoor activities do not involve or depend on appreciation of views, and those at work.
Value	– Designated viewpoint advertised on OS maps and in tourist information. – Location within an area (nationally) designated for landscape/scenic values. – Views with higher scenic quality, unaffected by overt or intrusive man-made elements.	– Viewpoints not advertised on OS maps or tourist information. – Location not within an area designated for landscape/scenic values. – Views with lower scenic quality, including overt or intrusive man-made elements.

Magnitude of Visual Change

Judgements regarding the magnitude of changes to views consider the size and scale, and geographical extent of the visual effect, and its duration and reversibility.

The size and scale of a visual change depends on:

- the scale of the change in view with respect to the loss or addition of features in the view and changes in its composition, including the proportion of the view occupied by the Proposed Development;

- the degree of contrast or integration of any new features or changes in the view with the existing elements in the view and their characteristics in terms of form, scale,mass, line, height, colour, texture and lighting; and
- the nature of the view of the Proposed Development, in terms of the relative amount of time over which it will be experienced along routes and whether views will be full, partial or glimpses.

All changes to views are considered as they will occur in winter conditions without snow cover, being the maximum case situation with minimal screening by vegetation and deciduous trees. Wirelines and ZTV maps are calculated on the basis of bare ground and therefore also demonstrate the maximum extent of visibility possible, in the absence of buildings or vegetation.

Given that wind farms currently exist in the study area, the scale and size of change also considers the relationship between the Proposed Development and other wind farms in the landscape, including consideration of:

- the arrangement of wind farms in the view, e.g. developments seen in one direction or part of the view (combined views), or seen in different directions (successive views in which the viewer must turn) or developments seen sequentially along a route;
- the relationship between the scale of the wind farms, including turbine size, proportions and number;
- the position of the wind farms in the view, e.g. on the skyline or against the backdrop of land; and
- the distances between wind farms, and their distances from the viewer, and
- how the Proposed Development fits with the pattern of wind farm development visible.

It should be noted that the assessment considers the differences in turbine sizes between wind farms in terms of their appearance from each assessment location, rather than relying on comparisons in numerical terms.

The geographical extent of visual changes records the extent of the area over which the changes will be visible, e.g. whether this is a unique viewpoint from where the Proposed Development can be glimpsed, or whether it represents a large area from which similar views are gained. Some viewpoints used in the assessment have been selected to represent typical views from wider areas; others have been selected as specific views. The geographical extent of the visual effect is defined in each case.

The duration of changes to views is taken as being short-term and temporary for construction and decommissioning effects and long term and theoretically reversible for operational effects.

Size/scale, geographical extent and duration/reversibility are combined to form a judgement as to the overall magnitude of the visual change, recorded as ‘high’, ‘medium’, ‘low’ or ‘negligible’. Magnitude of change is described based on an evaluation of criteria such as those set out in Table 5, using professional judgement to balance several factors that may raise or lower the magnitude judgement.

‘High’ is assigned to a change that meets the criteria indicating higher changes, or where one or more criteria are considered to be sufficiently important to outweigh other ‘lower’ criteria.

‘Low’ or ‘negligible’ is assigned to receptors where criteria fall into the lower part of the scale, ‘medium’ is assigned to receptors where criteria are mixed or of intermediate levels.

Table 5 – Magnitude of Change to the Visual Resource

Criteria tending towards Higher or Lower Magnitude of Change		
	Higher ⟵	⟶ Lower
Scale	– Proposed Development is large in the view; – Large proportion of the view affected.	– Proposed Development forms a small feature in the view; – Small proportion of the view affected.
Geographical Extent	– Large areas affected by change; – Changes perceived as close to the receptor; – Changes viewed over prolonged section(s) of a route.	– Limited area affected; – Changes perceived as distant from receptor.

Judging the Levels of Visual Effect and Significance

As for landscape effects, visual effects are judged on the combined aspects of susceptibility, value, size and scale, geographical extent, duration and reversibility. In the same way, four levels of effect are used,

major, moderate, minor and negligible. Major and moderate effects are considered to be significant in the context of EIA Regulations.

Table 6 sets out various criteria and descriptions that are used to guide judgments as to the level of effect.

Table 6 – Levels of Effect: Effects

<table>
<tr><td colspan="4">Criteria tending towards Higher or Lower Effect</td></tr>
<tr><td>Major</td><td>Moderate</td><td>Minor</td><td>Negligible</td></tr>
<tr><td colspan="2">HIGHER LEVEL OF EFFECT
Effects on people who may be particularly sensitive to changes in views/ visual amenity, or at recognised viewpoints or from recognised scenic routes.
Large scale changes which introduce new, non-characteristic or discordant or intrusive elements into the view.
These may be long term/ irreversible effects.</td><td colspan="2">LOWER LEVEL OF EFFECT
Effects on people who are generally less sensitive to changes in views/ visual amenity.
Small changes or changes which are well integrated into the view, often involving features already present in the view.
These may be reversible effects or of short duration.</td></tr>
<tr><td colspan="2">Significant</td><td colspan="2">Not Significant</td></tr>
<tr><td>The Proposed Development results in substantial changes in the view, and may become a defining influence or key focal point in the view.</td><td>The Proposed Development results in clearly visible changes to the view, and may form an important but not defining element of the view.</td><td>The Proposed Development results in slight changes to the view, and is neither dominant nor prominent, but is visible in the view.</td><td>The Proposed Development results in hardly perceptible changes to the view, may go unnoticed as a minor element in the view, or is not visible.</td></tr>
</table>

Aviation Lighting Effects

Visual effects of aviation lighting are considered in Technical Appendix 7.5, based on data set out in the technical assessment of lighting effects in Technical Appendix 16.1.

4.0 Assessment of Cumulative Effects

4.1 The Aim of Cumulative Assessment

The methodology for the CLVIA is similar to that of the LVIA as set out above, although it focuses on the role played by the Proposed Development amongst other wind farms.

The key difference between LVIA and CLVIA is that some of the wind farms in the cumulative baseline do not currently exist. The judgements made in the LVIA are made in the context of the landscape, all its features and characteristics, the existing nature, quality and type of available views etc., that exist at the time of the assessment, and therefore includes all existing wind farms. The way in which the Proposed Development relates to existing wind farms is set out in the LVIA, and the cumulative effect of this 'scenario' forms an element of the LVIA. In this sense, the LVIA represents the 'first level' of a cumulative assessment (that which would consider introducing the Proposed Development into the landscape in the context of existing wind farms).

The next 'levels' of the CLVIA include wind farms that may be consented but not yet built and those forming undetermined applications (including those under appeal). These possible future developments are assumed to be present for the purposes of CLVIA. In the consideration of cumulative effects, particular attention is given to the relationships between wind farms in the cumulative baseline, and how those relationships will change with the addition of the Proposed Development.

The aim of the CLVIA is to "*describe, visually represent and assess the ways in which a proposed windfarm would have additional impacts when considered together with other existing, consented or proposed windfarms*" (NatureScot, 2021). A cumulative assessment considers different cumulative scenarios, in addition to the existing baseline scenario:

- Consented Scenario: the addition of the Proposed Development in the context of operational, under construction and consented wind farms, i.e. a likely future scenario.
- In-Planning Scenario: the addition of the Proposed Development in the context of operational, under construction, consented, undetermined planning applications and wind farm developments currently at appeal, i.e. a less certain future scenario.
- Scoping Scenario: regarding sites at scoping stage, NatureScot guidance states "*Occasionally it may be appropriate to include proposals in an assessment which are at earlier stages of development*

(including at scoping), particularly where clusters of development or "hotspots" emerge, or where proposals are adjacent to one another. However, a degree of pragmatism is required to enable proposals to progress to determination, and to cater for proposals which may not yet be in the public domain" (NatureScot, 2021). Scoping stage sites are therefore considered carefully in terms of whether their inclusion is important for the identification of potential/ significant effects, given that it is a highly speculative scenario. For this assessment, the closest site at scoping stage is M74 West, approximately 15 km away beyond the Clyde group, and therefore this scenario has been scoped out.

4.2 The Stages of Assessment

The assessment of effects in the CLVIA includes a range of components or types of effect that must be identified in order to inform the decision maker on what 'contribution is made by' or 'role played by' the Proposed Development in the context of the overall accumulation of wind farms in the study area. Therefore, it considers both additive effects (which might be seen as quantitative effects) and 'overall' or 'in the round' effects (which might be seen as qualitative effects). Logical analysis and reasoning need to be applied to judge the significance of the effect.

To undertake a CLVIA, further information is required to inform the assessment and further professional judgements will be necessary as part of the assessment. Further information required for the CLVIA includes:

- information setting out the differing baseline scenarios against which judgements are made;
- analysis of existing and / or emerging patterns of wind farm development in the landscape;
- preparation and analysis of combined ZTVs that focus on those areas where significant effects are most likely, and those schemes with which significant effects are most likely;
- information regarding:
  - the directions of view in which the Proposed Development is visible in context of other developments;
  - proximity of the Proposed Development to the viewer and relative to other developments;
  - composition, setting, scale and size of developments and how the Proposed Development compares with these; and
- visualisations (wireframes) showing the Proposed Development relative to other schemes.

The cumulative wind farms are shown on wireline visualisations, in accordance with NatureScot (SNH, 2017) guidance.

Taking a precautionary approach, the sensitivity of receptors used for the cumulative assessment is taken to be the same as that identified in the LVIA.

4.3 Identification of Scope

The process for identifying wind farms to be considered in detail in the CLVIA excluded single wind turbines of less than 50 m to blade tip height. Data was collected for wind farms within 45 km of the Proposed Development; those within approximately 25 km are shown on Figure 7.9. A 'cut-off' date was set to be approximately 4-6 months prior to submission to provide as up to date a baseline as possible whilst allowing time for the assessment and modelling to be undertaken. The cut-off date for the CLVIA in Technical Appendix 7.4 was April 2024.

The assessment of effects focussed on wind farms with the potential to have significant cumulative relationships with the Proposed Development, which tended to be those within approximately 15-20 km of the Proposed Development.

Reporting of effects was further focussed on receptors for which the changes to the baseline in the cumulative scenarios created a change in relationships between developments in the view or landscape. It is not simply scoping the cumulative assessment to include only receptors for which greater effects have been identified in the 'Existing Scenario' (LVIA), as the level of change in the cumulative baseline can affect the results as much as the prominence of the Proposed Development.

4.4 Levels of Effect

Additional Effects

The levels of additional cumulative effect are set out as major, moderate, minor or negligible using the same considerations as the LVIA methodology set out above and taking the level of effect to be the

additional change as a result of the Proposed Development relative to the scenario baseline (as if all other schemes were existing).

The levels of effect identified in the cumulative scenarios are compared with the effects identified in the LVIA (the existing scenario), by means of description, which sets out whether the change in baseline means there will be increased or reduced effect created by the Proposed Development in that context.

Combined Effects

Combined or synergistic effects, effects for which the overall change is greater than the sum of the parts, are relevant for cumulative relationships between wind farms where there may be, for example, a number of discrete wind farms, which together create the sense of a group or band of wind farms across the landscape. These types of effects relate to patterns of development across the landscape and the role that the Proposed Development plays in altering the sense of wind energy development in the surrounding area.

Patterns of development are discussed in the LVIA and the cumulative assessment, and are considered using a series of thresholds or levels to indicate the degree to which the area is characterised by wind energy development, including:

- a landscape with occasional wind farms: wind turbines or wind farms are seen as separate isolated features within the landscape character type, too infrequent and of insufficient significance to be perceived as a characteristic of the area;
- a landscape with wind farms: wind turbines or wind farms are seen as a characteristic of the landscape, but not of sufficient dominance to be a defining characteristic of the area; and
- a wind farm landscape: wind turbines or wind farms appear as a dominant characteristic of the area.

A significant in-combination cumulative effect will be one in which the introduction of the Proposed Development will cause a change from one level to the next. Not significant effects are those in which the introduction of the Proposed Development may cause an increase in the perceptions of wind farms in the landscape but will not alter the degree to which the area is characterised by wind energy development (using the levels set out above).

5.0 Implications of Effects for Designated Landscapes

The implications for designated landscapes as a result of the Proposed Development are considered against the values, aims and/or special qualities of the designated areas and whether the Proposed Development will compromise the integrity of the designation. This section, necessarily at the end of the chapter, does not draw conclusions about *effects on designated areas* in order to avoid double counting of effects over the same areas of landscape as the landscape assessment, or the same views as the assessment of effects on views and visual amenity. Instead, the section draws out which effects (identified in the assessment sections) would affect the special qualities of the area and the reasons for which it was designated, to conclude on whether the integrity of the designated area would be affected.

6.0 Graphics Production

Graphics and visualisations are provided to support the assessment of effects. Visualisations for the assessment viewpoints have been produced in accordance with current good practice guidance from NatureScot (SNH, 2017) and the Landscape Institute (LI, 2019).

Data Used for Modelling

- OS Terrain® 50 height data (DTM) (50 m grid spacing, 4 m RMSE) for wider landscape modelling;
- OS Terrain® 5 mid-resolution height data (digital terrain model (DTM)) (5 m grid spacing, 2.5 m RMSE) for detailed modelling where required;
- Ordnance Survey 1:50,000 raster data; and
- Ordnance Survey 1:250,000 raster data.

6.1 ZTV Mapping

The Ordnance Survey digital terrain model (DTM) is used as an input for the production of map-based graphics and ZTV mapping. ZTVs use the turbine dimensions (tip height and hub height) and DTM and

assume a viewer height of 2 m. The calculation uses a 'bare ground' computer-generated terrain model, which does not take account of potential screening by buildings or vegetation.

This is considered to over-emphasise the extent of visibility of the Proposed Development and therefore represents a 'maximum potential visibility' scenario. Separate ZTVs are run from the tip heights and hub heights of the proposed turbines, which can be used to indicate the proportion of the turbines likely to be visible. They take into consideration earth curvature and use a refraction coefficient of 0.13.

The ZTVs of the Proposed Development were calculated to show the number of turbines visible to blade tip height or hub height. The ZTV calculated to blade tip height is shown on Figures 7.1 and 7.2. The hub height ZTV is shown on Figure 7.3.

To construct combined ZTVs (CZTVs) to illustrate the combined visibility of the Proposed Development with other wind farms, the ZTV to tip height of each wind farm was generated (based on the tip height of each turbine to a radius in accordance with the current NatureScot guidance, SNH, 2017), and then combined with the Proposed Development ZTV. CZTVs are set up to show the number of wind farms (rather than the number of turbines) visible (Figures 7.10, 7.11 and 7.12), and are colour-coded to distinguish between areas where the Proposed Development is predicted to be visible (either on its own, or in conjunction with other wind farms), and areas where other wind farms will be visible but the Proposed Development will not be visible. The CZTVs do not necessarily identify which other wind farms will be visible, but paired CZTVs are provided where necessary to analyse the relationships between key wind farms.

The aviation lighting ZTV (Figure 7.8) was modelled as an aggregate of the minimum vertical viewing angle calculated for the three lit turbine hubs (Turbine 1, Turbine 3 and Turbine 6). This ZTV therefore shows the minimum vertical viewing angle for these turbines, i.e. the angle closest to the horizontal for the brightest light, which is not necessarily the closest turbine. Whilst the ZTV does not indicate which turbine will be the brightest, it indicates the least amount of downward reduction in intensity.

6.2 Viewpoint Photography

The methodology for photography is in accordance with guidance from NatureScot (SNH, 2017) and the LI (LI, 2019). The focal lengths used are in accordance with recommendations contained in guidance and are stated on the figures. Photography was undertaken by MVGLA between September 2022 and February 2024. Photography was taken in optimal visibility conditions wherever possible, though unpredictable weather makes more distant viewpoints harder to get ideal photographs for.

The location of each viewpoint and information about the conditions was recorded in the field in accordance with the guidance. The camera used for the photography was a Nikon D610 Full frame sensor digital SLR with a fixed 50 mm focal length lens.

A tripod with vertical and horizontal spirit levels was used to provide stability and to ensure a level set of adjoining images. The camera was set at 1.65 m from ground level and orientated to take photographs in landscape format[4]. A panoramic head was used to ensure the camera rotated about the no-parallax point of the lens in order to eliminate parallax errors between the successive images and enable accurate stitching of the images. The camera was moved through increments of 24˚ (degrees) and rotated through a full 360˚ at each viewpoint.

Weather conditions and visibility were considered an important aspect of the field visits for the photography. Where possible, visits were planned around clear days with good visibility. Viewpoint locations were visited at times of day to ensure, as far as possible, that the sun lit the scene from behind, or to one side of the photographer. South facing viewpoints can present problems particularly in winter when the sun is low in the sky. Photographs facing into the sun were avoided where possible to prevent the wind turbines appearing as silhouettes.

6.3 Visualisations

Photographic stitching software PTGui© and Adobe Photoshop© was used to stitch together the adjoining frames to create panoramic baseline photography.

The same terrain data used for the production of the ZTVs was also used to generate wireline drawings, using ReSoft Windfarm software. The DTM includes the Proposed Development site, viewpoint locations and all landform visible within the baseline photography. Turbine and viewpoint location coordinates were entered. Photomontages have been constructed to show the candidate turbine with the specified tip

[4] For close viewpoints, portrait photographs were also taken.

height, hub height and rotor diameter. Infrastructure elements and forest removal are also shown where they will be visible.

The stitched photographs were matched to the wirelines using Adobe Photoshop. Wirelines were produced using a viewer height of 1.65 m above the terrain height. The panoramic baseline photographic images were imported into the Adobe Photoshop software and from each viewpoint the wireline views of the landform model with proposed turbines were carefully adjusted to obtain a match. Fixed features on the ground, such as mountain summits, buildings and roads, were located in the model and used as markers to help with the alignment process where necessary. Each view was rendered taking account of the sunlight conditions and the position of the sun in the sky at the time the photograph was taken, although turbines may be given enhanced contrast in lighting relative to the background where conditions mean that they would otherwise have little visibility. Blade angle and orientation adjustments were also made to represent a realistic situation.

Adobe Photoshop© software was used to combine the images and mask out (remove) sections of turbines or solar arrays which were located behind foreground elements in the original photograph. Location and rendering of infrastructure was carried out with a similar process.

Finally, where applicable, the images were converted from Cylindrical Projection to Planar Projection using PTGui© software.

6.4 Dusk photomontages showing aviation lighting

Photography for night-time photomontages to illustrate potential effects of aviation lighting was carried out in the evening. A set of photographs was taken prior to sunset to ensure that the camera was correctly set up, and to allow cross reference between lights caught on dark photographs and buildings caught on daytime photographs. A series of photograph sets were taken over a period of about an hour and a half from sunset to full darkness. This enabled the photographer to take multiple sets as the sky darkened, with varied camera settings. Downloaded sets were then reviewed to select a set that best matched NatureScot advice on having the sky relatively dark and other lights in the landscape on, but the form of the landscape still visible.

Visualisations prepared for night-time views using photography taken during twilight were produced using the same method as for daylight photomontages, with turbines rendered dark as silhouettes. Images of aviation lights are provided for indicative illustration only and have been modelled on the basis of approximately 2000 candelafor viewpoints within 5 km, and 200 candela for viewpoints beyond 5 km, with attenuation for distance, using Technical Appendix 16.1 as reference.

6.5 Figure Layout

The dimensions for each image (printed height and field of view) are in accordance with NatureScot requirements (SNH, 2017). Photography information and viewing instructions are provided on each page where relevant. Thumbnail maps are provided for location reference[5]. A 5 cm rule is provided on each page to guide viewers when zooming in on electronic copies of the figures.

NatureScot pages include:

- the first A3 height x A1 width format page contains 90° baseline photography and wireline to illustrate the wider landscape, visual and cumulative context. These are shown in cylindrical projection and presented on an A1 width page. Additional pages in the same format are provided if necessary to illustrate wider cumulative visibility up to 360°; and
- the subsequent pages contain 53.5˚ wireline (showing the LVIA baseline) and photomontage of the view towards the Proposed Development. These images are shown in planar projection and presented on an A1 width page.

[5] Reproduced from Ordnance Survey digital map data @ Crown Copyright 2022. Licence no. 100048957.

7.0 Assessment Limitations

Limitations to the LVIA include a reliance on bare-ground modelling for wireframes and ZTVs used in graphics, which does not take account of potential screening by buildings and vegetation.

The theoretical visibility indicated by the bare-ground models is therefore an over-estimation of visibility. Actual visibility is described for receptors based on field work and is illustrated in photomontages.

Whilst this issue has been identified, it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely significant effects on landscape and visual amenity.

It should be noted that illustrations and modelling cannot replace the need for site visits and can only be used to represent what people may see from the viewpoint. Whilst accuracy of modelling is essential, modelling can only be as accurate as the data used and cannot be used to replace field visits. It is noted also that the movement of the proposed turbines may render them more noticeable in the view that a static photograph/photomontage can portray.

Limitations to the cumulative assessment include the uncertainty of whether the proposed wind farms will be built in the future. This includes consented schemes that may or may not be built. The assessment also relies on currently available data, and it should be noted that the locations and specifications of turbines may change for proposed and consented schemes before they are actually built, through redesign and/or micrositing.

8.0 References

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