

Appendix 5.1: LVIA and Visualisation Methodology

Introduction

- 5.1 This appendix sets out the detailed methodology used in Chapter 5: Landscape and Visual Amenity. The methodology for the production of accompanying visualisations was based on current good practice guidance as set out by Scottish Natural Heritage (SNH)¹, now renamed as NatureScot.
- 5.2 Landscape and visual assessments are separate, although linked, processes. LVIA therefore considers the potential effects of a proposed development on:
- 5.3 Landscape as a resource in its own right (caused by changes to the constituent elements of the landscape, its specific aesthetic or perceptual qualities and the character of the landscape); and
- 5.4 Views and visual amenity as experienced by people (caused by changes in the appearance of the landscape).
- 5.5 LVIA deals with landscape and visual effects separately, followed by an assessment of cumulative landscape and visual effects where relevant.

Guidance

- 5.6 This methodology has been developed by Chartered Landscape Architects (Chartered Members of the Landscape Institute (CMLI)) at LUC, who have extensive experience in the assessment of landscape and visual effects arising from wind energy developments.
- 5.7 The methodology has been developed primarily in accordance with the principles contained within the Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3)². SNH cumulative guidance³ also informs the approach to the assessment of cumulative landscape and visual effects in relation to onshore wind energy development.

Scope of an Assessment

- 5.8 An LVIA considers physical changes to the landscape as well as changes in landscape character. It also considers changes to areas designated for their scenic or landscape qualities, and the visual impacts of a proposed development as perceived by people.

- 5.9 All potentially significant landscape and visual effects (including cumulative effects) are examined, including those relating to construction, operation and, where relevant, decommissioning.
- 5.10 Where it is judged that significant effects are unlikely to occur, the assessment of potential effects on some receptors may be 'scoped out'; for an Environmental Impact Assessment (EIA) development this is usually agreed at scoping stage.

Assessment Methodology

Study Area

- 5.11 The study area for an LVIA is determined by the nature and scale of the development proposed and the nature of the study area (e.g. complex topography or extensive tree cover leading to visually enclosed areas may limit the extent of likely significant effects).

Methodological Overview

- 5.12 The key steps in the methodology for assessing landscape and visual effects are as follows:
- the landscape of the study area is analysed and landscape receptors identified, informed by desk and field survey;
 - the area over which the development will potentially be visible is established through the creation of an initial Zone of Theoretical Visibility (ZTV) plan⁴;
 - the visual baseline is recorded in terms of the different receptors (groups of people) who may experience views of the development (informed by the initial ZTV) and the nature of their existing views and visual amenity;
 - potential assessment viewpoints are selected, as advocated by GLVIA3 to represent a range of different receptors and views, in consultation with statutory consultees;
- **'Representative viewpoints, selected to represent the experience of different types of visual receptor, where larger numbers of viewpoints cannot all be included individually and where the significant effects are unlikely to differ - for example, certain points may be chosen to represent the views of users of particular public footpaths and bridleways;**
- **Specific viewpoints, chosen because they are key and sometimes promoted viewpoints within the landscape, including for example specific local visitor attractions, viewpoints in areas of particularly noteworthy visual and/or recreational amenity such as landscapes with statutory landscape designations, or viewpoints with particular cultural landscape associations;**
- **Illustrative viewpoints, chosen specifically to demonstrate a particular effect or specific issues, which might, for example, be the restricted visibility at certain locations'** (GLVIA3, Para. 6.19, Page 109).

¹ Scottish Natural Heritage (2017) Visual Representation of Wind Farms Guidance, Version 2.2

² The Landscape Institute and Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment, 3rd Edition

³ NatureScot(2021) Assessing the cumulative impact of onshore wind energy developments

⁴ A ZTV indicate areas from where a development is theoretically visible, but they cannot show what it would look like, nor indicate the nature or magnitude of landscape or visual impacts

- likely significant effects on both the landscape as a resource and visual receptors are identified; and
- the level (and significance) of landscape and visual effects are judged with reference to the nature of the receptor (commonly referred to as the sensitivity of the receptor), which considers both susceptibility and value, and the nature of the effect (commonly referred to as the magnitude of effect), which considers a combination of judgements including size/scale, geographical extent, duration and reversibility.

Direction of Effects

- 5.13 As required by the EIA Regulations⁵, the assessment must identify the direction of effect as either being beneficial (positive), adverse (negative) or neutral.
- 5.14 The direction of landscape, visual and cumulative effects (**beneficial, adverse** or **neutral**) is determined in relation to the degree to which the proposal fits with the existing landscape character or views, and the contribution to the landscape or views that the proposed development makes, even if it is in contrast to the existing character of the landscape or views.
- 5.15 With regard to wind energy development, whilst there is a broad spectrum of response from the strongly positive to the strongly negative, an assessment is required to take an objective approach. Therefore, to cover the ‘maximum case effect’ situation, potential landscape and visual effects relating to commercial scale wind farm developments are generally assumed to be adverse (negative).

Method for Assessing Landscape Effects

- 5.16 As outlined in GLVIA3 ‘An assessment of landscape effects deals with the effects of change and development on landscape as a resource.’ (GLVIA3, Para 5.1, Page 70). Changes may affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character.
- 5.17 An assessment of landscape effects requires consideration of the nature of landscape receptors (sensitivity of receptor) and the nature of the effect on those receptors (magnitude of effect). 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 effect on each landscape receptor, commonly referred to as its magnitude, should be assessed in terms of size and scale of effect, geographical extent, duration and reversibility.
- 5.18 These aspects are considered together, to form a judgement regarding the overall significance of landscape effects (GLVIA3, Figure 5.1 Page 71). The following sections set out the methodology used to evaluate sensitivity and magnitude.

Sensitivity of Landscape Receptors

- 5.19 The sensitivity of a landscape receptor to change is defined as **high, medium** or **low** and is based on weighing up professional judgements regarding susceptibility and value, as set out below.

Sensitivity of Landscape Receptors			
	Higher	↔	Lower
Susceptibility	Attributes that make up the character of the landscape offer very limited opportunities for the accommodation of change without key characteristics being fundamentally altered by wind energy development, leading to a different landscape character.	↔	Attributes that make up the character of the landscape are resilient to being changed by wind energy development.
Value	Landscapes with high scenic quality, high conservation interest, recreational value, important cultural associations or a high degree of rarity. Areas or features designated at a national level e.g. National Parks or National Scenic Areas or key features of these with national policy level protection.	↔	Landscape of poor condition and intactness, limited aesthetic qualities, or of character that is widespread. Areas or features that are not formally designated.

Susceptibility of Landscape Receptors

- 5.20 Susceptibility is defined by GLVIA3 as ‘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 consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies’ (GLVIA3 paragraph 5.40).
- 5.21 A series of criteria are used to evaluate the susceptibility of Landscape Character Types (LCTs) or Landscape Character Areas (LCAs) to wind energy development as set out in the table below. These criteria or aspects are drawn from a range of published sources relating to wind farm development, including Siting and Designing Windfarms in the Landscape (SNH, 2017) and GLVIA3.

Aspects Influencing Susceptibility of Landscape Receptors to Wind Turbines			
Characteristic/attribute	Aspects indicating reduced susceptibility to wind energy development	↔	Aspects indicating greater susceptibility to wind energy development

⁵ The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations (2017) (as amended)

Aspects Influencing Susceptibility of Landscape Receptors to Wind Turbines			
Scale	Large scale	↔	Small scale
Value	Absence of strong topographical variety, featureless, convex or flat	↔	Presence of strong topographical variety or distinctive landform features
Landscape pattern and complexity	Simple Regular or uniform	↔	Complex Rugged and irregular
Settlement and man-made influence	Presence of contemporary structures e.g. utility, infrastructure or industrial elements	↔	Absence of modern development Presence of small scale, historic or vernacular settlement
Skylines	Non-prominent /screened skylines Presence of existing modern man-made features	↔	Distinctive, undeveloped skylines Skylines that are highly visible over large areas or exert a large influence on landscape character Skylines with important historic landmarks
Inter-visibility with adjacent landscapes	Little inter-visibility with adjacent sensitive landscapes or viewpoints	↔	Strong inter-visibility with sensitive landscapes Forms an important part of a view from sensitive viewpoints
Perceptual aspects	Close to visible or audible signs of human activity and development	↔	Remote from visible or audible signs of human activity and development

5.22 Published landscape capacity or sensitivity studies (where they exist) may be reviewed to inform the evaluation of susceptibility, in addition to fieldwork undertaken across the study area. This review includes an evaluation as to the relevance of the publication to the assessment being undertaken (e.g. consideration of the purpose and scope of the published studies and whether they have become out of date).

5.23 Landscape susceptibility is described as being **high, medium** or **low**.

Value of Landscape Receptors

5.24 The European Landscape Convention advocates that all landscape is of value, whether it is the subject of defined landscape designation or not: 'The landscape is important as a component of the environment and of people's surroundings in both town and country and whether it is ordinary landscape or outstanding landscape.'⁶ The value of a landscape

receptor is recognised as being a key contributing factor to the sensitivity of landscape receptors.

5.25 The value of landscape receptors is determined with reference to:

- Review of relevant designations and the level of policy importance that they signify (such as landscapes designated at international, national or local level); and/or
- Application of criteria that indicate value (such as scenic quality, rarity, recreational value, representativeness, conservation interests, perceptual aspects and artistic associations) as described in GLVIA3, paragraphs 5.44 - 5.47.

5.26 Internationally and nationally designated landscapes would generally indicate landscape of higher value whereas those without formal designation (such as a widespread or common landscape type without high scenic quality) are likely to be of lower value, bearing in mind that all landscapes are valued at some level. There is however variation across both designated and undesignated areas, and so judgements regarding value are also informed by fieldwork.

5.27 Landscape value is described as being **high, medium** or **low**.

Magnitude of Landscape Effect

5.28 The overall judgement of magnitude of landscape effect is based on combining professional judgements on size and scale, geographical extent, duration and reversibility. Further information on the criteria is provided below.

Size and Scale of Effect

5.29 For landscape elements/features this depends on the extent of existing landscape elements that would be lost or changed, the proportion of the total extent that this represents, and the contribution of that element to the character of the landscape.

5.30 In terms of landscape character, this reflects the degree to which the character of the landscape would change as a result of removal or addition of landscape components, and how the changes would affect key characteristics.

5.31 The size and scale of the effect is described as being **large, medium, small**, or **barely perceptible**.

Geographical Extent of Effect

5.32 The geographical extent over which the landscape effect would arise is described as being **large** (scale of the landscape character type, or widespread, affecting several landscape types or character areas), **medium** (more immediate surroundings) or **small** (site level).

⁶ Council of Europe, (2000). The European Landscape Convention – Council of Europe Treaty Series No. 176.

Duration of Effect

5.33 GLVIA3 states that ‘Duration can usually be simply judged on a scale such as short term, medium term or long term.’ For the purposes of the assessment, duration is often determined in relation to the phases of the proposed development, as follows:

- **Short-term** effects are those that occur during construction, and may extend into the early part of the operational phase, e.g. construction activities, generally lasting 0 - 5 years;
- **Medium-term** effects are those that occur during part of the operational phase, generally lasting 5 - 10 years; and
- **Long-term** effects are those which occur throughout the operational phase (in this instance 35 years), e.g. presence of turbines, or are permanent effects which continue after the operational phase, generally lasting over 10 years.

Reversibility of Effect

5.34 In accordance with the principles contained within GLVIA3, reversibility is reported as **reversible**, **partially reversible** or **irreversible** (i.e. permanent), and is related to whether the change can be reversed at the end of the phase of development under consideration (i.e. at the end of construction or at the end of the operational lifespan of the development).

5.35 Judgements on the magnitude of landscape effect (nature of landscape effect) are recorded as **high**, **medium** or **low** and are guided by the table below.

Magnitude of Landscape Effect			
	Higher	↔	Lower
Size/Scale	Extensive loss of landscape features and/or elements, and/or change in, or loss of key landscape characteristics, and/or creation of new key landscape characteristics	↔	Limited loss of landscape features and/or elements, and/or change in or loss of some secondary landscape characteristics
Geographical Extent	Change in landscape features and/or character extending considerably beyond the immediate site and potentially affecting multiple landscape character types/areas	↔	Change in landscape features and/or character extending contained within or local to the immediate site and affecting only a small part of the landscape character type/area
Duration	Changes experienced for a period of around 10 years or more	↔	Changes experienced for a shorter period of up to 5 years
Reversibility	Change to features, elements or character which cannot be undone or are only partly reversible after a long period	↔	A temporary landscape change which is largely reversible following the completion of construction, or decommissioning of the development

Judging Levels of Landscape Effect and Significance

5.36 The final step in the assessment requires the judgements of sensitivity and magnitude of effect to be combined to make an informed professional assessment on the significance of each landscape effect (GLVIA3, Figure 5.1, Page 71).

5.37 There may be a complex relationship between the value attached to a landscape and the susceptibility of the landscape to a specific change. Therefore, the rationale for judgements on the sensitivity of landscape receptors needs to be clearly set out for each receptor. 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 such landscapes all have a high susceptibility to all types of change, and conversely, undesignated landscapes may also have high value and susceptibility to change (GLVIA3, Page 90).

5.38 Although a numerical or formal weighting system is not applied, consideration of the relative importance of each aspect is made to feed into the overall decision. Levels of effect are identified as **negligible**, **minor**, **moderate** or **major** where moderate and major effects are considered **significant** in the context of the EIA Regulations.

5.39 This determination requires the application of professional judgement and experience to take on board the many different variables which need to be considered, and which are given different weight according to site-specific and location-specific considerations in every instance. Judgements are made on a case by case basis, guided by the principles set out in Diagram 1 below. A rigid matrix-type approach, which does not take on board professional judgement and experience, and where the level of effect is defined simply based on the level of sensitivity (nature of receptor) combined with the magnitude of change (nature of effect), is not used. As such, the conclusion on the level of effect is not always the same.

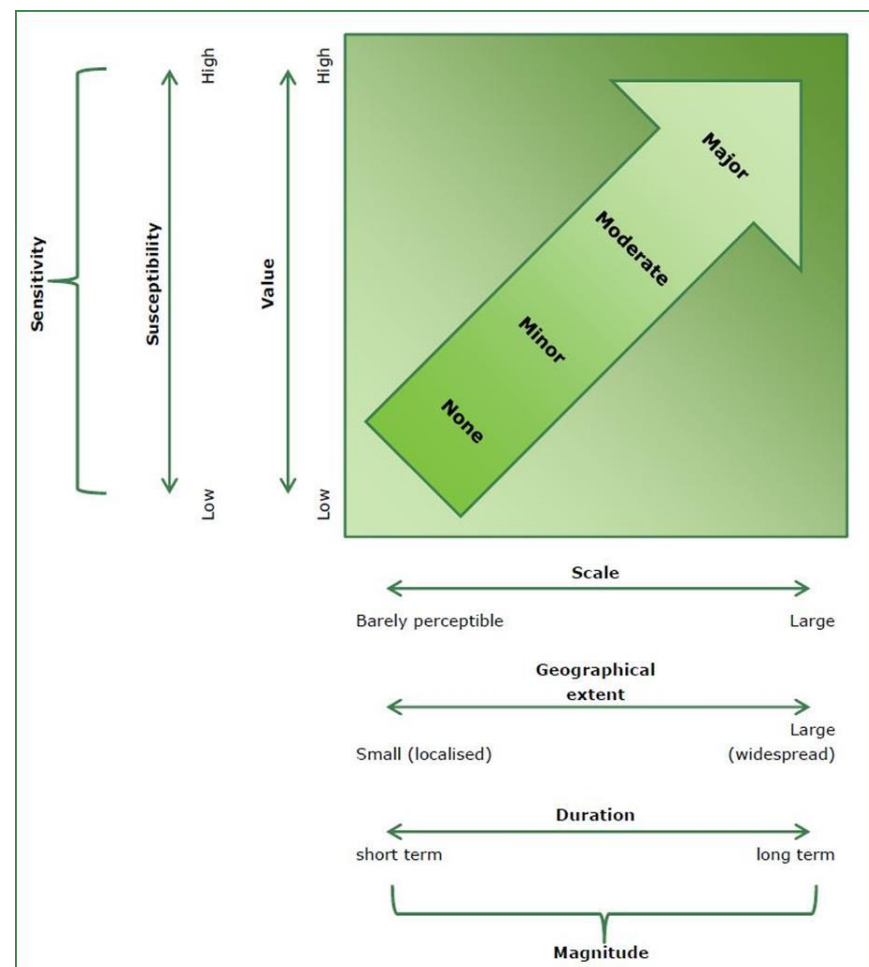


Diagram 1 - Judging levels of effect - Landscape or Visual (including cumulative)

Method for Assessing Visual Effects

Significance of Visual Effects

- 5.40 As outlined in GLVIA3 ‘An assessment of visual effects deals with the effects of change and development on views available to people and their visual amenity’ (GLVIA3, Para. 6.1, Page 98). Changes in views may be experienced by people at different locations within the study area including from static locations (normally assessed using representative viewpoints) and whilst moving through the landscape (normally referred to as sequential views, e.g. from roads and walking routes).
- 5.41 Visual receptors are individuals or groups of people who may be affected by changes in views and visual amenity. They are usually grouped by their occupation or activity (e.g. residents, motorists, recreational users) and the extent to which their attention is focused on the view (GLVIA3, Paras. 6.31 - 6.32, Page 113).

5.42 GLVIA3 states that the sensitivity of visual receptors should be assessed in terms of the susceptibility of the receptor to change in views and/or visual amenity and the value attached to particular views. The magnitude of effect should be assessed in terms of the size and scale, geographical extent, duration and reversibility of the effect.

5.43 These aspects are considered together, to form a judgement regarding the overall significance of visual effect (GLVIA3, Figure 6.1 Page 99). The following sections set out the methodology used to evaluate sensitivity and magnitude.

Sensitivity of Visual Receptor

5.44 The sensitivity of a visual receptor to change is defined as **high**, **medium** or **low** and is based on weighing up professional judgements regarding susceptibility and value, and each of their component considerations, as set out in the table below.

Sensitivity of Visual Receptors			
	Higher	↔	Lower
Susceptibility	Viewers whose attention or interest is focused on their surroundings, including communities/ individual residential receptors/ people engaged in outdoor recreation/ visitors to heritage assets or other attractions where views of surrounding area an important contributor.	↔	People whose attention is not on their surroundings (and where setting is not important to the quality of working life) such as commuters/ people engaged in outdoor sports/ people at their place of work.
Value	Views may be recorded in management plans, guide books, and/or which are likely to be experienced by large numbers of people. Views may be associated with nationally designated landscapes; local authority designated landscapes; designed views recorded in citations for historic parks, gardens/scheduled monuments etc.	↔	Views which are not documented or protected. Views which are more incidental, and less likely to be associated with somewhere people travel to or stop, or which may be experienced by smaller numbers of people.

Susceptibility of Visual Receptors

5.45 The susceptibility of visual receptors to changes in views/visual amenity is a function of the occupation or activity of people experiencing the view and the extent to which their attention is focused on views (GLVIA 3, para 6.32). This is recorded as **high**, **medium** or **low** informed by the table below.

Susceptibility of Visual Receptors		
High	Medium	Low
<p>Viewers whose attention or interest is focussed on their surroundings, including:</p> <ul style="list-style-type: none"> communities where views contribute to the landscape setting enjoyed by residents; visitors to heritage assets, other attractions and popular hill summits where views of surroundings are an important contributor to experience; and formal or promoted stopping places on scenic or tourist routes. 	<ul style="list-style-type: none"> People engaged in outdoor recreation (including users of cycle routes, footpaths and public rights of way whose interest is likely to be partly focused on the landscape); People travelling in vehicles on scenic routes and tourist routes, where attention is focused on the surrounding landscape, but is transitory; and People at their place of work whose attention is focused on the surroundings and where setting is important to the quality of working life. 	<ul style="list-style-type: none"> People travelling more rapidly on more major roads, 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 of the landscape; and People at their place of work whose attention is not on their surroundings (and where setting is not important to the quality of working life).

Value of View or Visual Amenity

- 5.46 GLVIA3 also requires evaluation of the value attached to the view or visual amenity and relates this to planning designations and cultural associations (GLVIA3, Para. 6.37, Page 114).
- 5.47 Recognition of the value of a view is determined with reference to:
- planning designations specific to views including views with recognised scenic value;
 - whether it is recorded as important in relation to designated landscapes (such as views specifically mentioned in the special qualities of a National Park or National Scenic Area);
 - whether it is recorded as important in relation to heritage assets (such as designed views recorded in citations of Gardens and Designed Landscapes (GDL) or views recorded as of importance in Conservation Area Appraisals); and
 - the value attached to views by visitors, for example through appearances in guide books or on tourist maps, provision of facilities for their enjoyment and references to them in literature and art.
- 5.48 A designated viewpoint or scenic route advertised on maps and in tourist information, or which is a significant destination in its own right, such as a Munro summit, is likely to indicate a view of higher value. High value views may also be recognised in relation to the special qualities of a designated landscape or heritage asset, or it may be a view familiar from photographs or paintings.
- 5.49 Views experienced from viewpoints or routes not recognised formally or advertised in tourist information, or which are not provided with interpretation or, in some cases, formal access are likely to be of lower value.
- 5.50 Judgements on the value of views or visual amenity are recorded as **high, medium** or **low**.

Magnitude of Visual Effect

- 5.51 The overall judgement of magnitude of visual effect (nature of visual effect) is based on weighing up professional judgements on size and scale, geographical extent, duration and reversibility. Further information on the criteria is provided below.

Size and Scale

- 5.52 The size and scale of a visual change depends on:
- the scale of the change in the 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 landscape with the existing or remaining landscape elements and characteristics in terms of form, scale and mass, line, height, colour and texture; and
 - the nature of the view of the proposed development, in terms of the relative amount of time over which it will be experienced and whether views will be full, partial or glimpses.
- 5.53 All changes are assumed to be during winter, representing a 'maximum case effect' scenario with minimal screening by vegetation and deciduous trees. Note that wireframes and ZTVs prepared to illustrate potential visual effects are calculated on the basis of bare ground and therefore demonstrate the maximum extent of visibility possible, in the absence of buildings or vegetation. Where forestry is present, consideration is given to felling regimes if levels of screening by forestry are likely to change notably during the lifetime of the proposed development.
- 5.54 In this assessment scale of visual change is described as being **large, medium, small** or **barely perceptible**.

Geographical Extent

- 5.55 The geographical extent of a visual change 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 wind farm can be glimpsed, or whether it represents a large area from which similar views are gained. Geographical extent is described as being **large, medium** or **small**.

Duration

- 5.56 The duration of visual effects is reported as **short-term, medium-term** or **long-term**, as defined for the duration of landscape effects (see above).

Reversibility

- 5.57 Reversibility is reported as **irreversible** (i.e. permanent), **partially reversible** or **reversible**, and is related to whether the visual change can be reversed at the end of the phase of development under consideration (i.e. at the end of construction or at the end of the operational lifespan of the development). Operational visual effects are generally considered

to be partially reversible as the decommissioning phase will remove turbines and most infrastructure at the end of the operational phase.

5.58 Judgements on the magnitude of visual effect are recorded as **high**, **medium** or **low** guided by the table below.

Magnitude of Visual Effects			
	Higher	↔	Lower
Size/Scale	A large visual change resulting from the proposed development is the most notable aspect of the view, perhaps as a result of the development being in close proximity, or because a substantial part of the view is affected, or because the development introduces a new focal point and/or provides contrast with the existing view and/or changes the scenic qualities of the view.	↔	A small or some visual change resulting from the proposed development as a minor or generally unnoticed aspect of the view, perhaps as a result of the development being in the distance, or because only a small part of the view is affected, and/or because the development does not introduce a new focal point or is in contrast with the existing view and/ does not change the scenic qualities of the view.
Geographical Extent	The assessment location is clearly representative of similar visual effects over an extensive geographic area.	↔	The assessment location clearly represents a small geographic area.
Duration	Visual change experienced over around 10 years or more	↔	Visual change experienced over a short period of up to 5 years.
Reversibility	A permanent visual change which is not reversible or only partially reversible following decommissioning of the proposed development.	↔	A temporary visual change which is largely reversible following the completion of construction, or decommissioning of the proposed development.

Direction of Visual Effects

5.59 The direction of visual effects (**beneficial**, **adverse** or **neutral**) is determined in relation to the degree to which the proposal fits with the existing view and the contribution to the view that a proposed development makes, even if it is in contrast to the existing character of the view.

5.60 With regard to wind energy development there is a broad spectrum of response from the strongly positive to the strongly negative. However, to cover the ‘maximum case effect’ situation, potential visual effects relating to commercial scale wind energy developments are generally assumed to be adverse.

Judging the Level of Visual Effect and Significance

5.61 As for landscape effects, the final step in the assessment requires the judgements of sensitivity of visual receptor and magnitude of visual effect to be combined to make an informed professional assessment on the significance of each visual effect.

5.62 The evaluations of the individual aspects set out above (susceptibility, value, size and scale, geographical extent, duration and reversibility) are considered together to provide an overall profile of each identified visual effect. An overview is then taken of the distribution of judgements for each aspect to make an informed professional assessment of the overall level of effect, drawing on good practice guidance provided in GLVIA3.

5.63 The sensitivity of visual receptors may involve a complex relationship between a visual receptors (e.g. people’s) susceptibility to change and the value attached to a view. Therefore, the rationale for judgements of sensitivity is clearly set out for each receptor in relation to both its susceptibility (to the type of change proposed) and its value.

5.64 A rigid matrix-type approach, where the level of visual effect is defined simply based on the level of sensitivity combined with the magnitude of effect is not used. As such, the conclusion on the level of effect is not always the same. Although a numerical or formal weighting system is not applied, consideration of the relative importance of each aspect is made to feed into the overall decision. Levels of visual effect are identified as **negligible**, **minor**, **moderate** or **major** where moderate and major visual effects are considered **significant** in the context of the EIA Regulations.

5.65 This determination requires the application of professional judgement and experience to take on board the many different variables which need to be considered, and which are given different weight according to site-specific and location-specific considerations in every instance. As such, the conclusion on the level of effect is not always the same. Judgements are made on a case by case basis, guided by the same principles as set out in **Diagram 1** above.

Cumulative Landscape & Visual Impact Assessment (CLVIA)

5.66 The aim of a Cumulative Landscape and Visual Impact Assessment (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.

5.67 The cumulative assessment therefore focuses on the additional cumulative change which may result from the introduction of a proposed development. The cumulative assessment also makes reference to total (also referred to as combined) cumulative effects, where these have the potential to be significant. A cumulative assessment may also consider the potential interactions between different types of development (e.g. transmission infrastructure, other energy generation stations or other built development) if these are likely to result in similar landscape and visual impacts.

5.68 As with an LVIA, a CLVIA deals with cumulative landscape and visual effects separately.

Differences between LVIA and CLVIA

- 5.69 Although both LVIA and CLVIA look at the effects of a proposed development on the landscape and on views, there are differences in the baseline against which the assessments are carried out.
- 5.70 For the LVIA, the baseline includes existing wind farm developments which are present in the landscape at the time of undertaking the assessment, which may be either operational or under construction, as they form a part of the baseline situation. Their presence has the potential to influence the assessment of effects on landscape character and the assessment of effects on views. For the CLVIA the baseline is partially speculative and includes:
- **Scenario 1** - operational, under construction and wind farms which have been granted planning consent but are not yet constructed (**consented**); and
 - **Scenario 2** - Scenario 1, plus submitted valid wind farm applications which are currently awaiting determination by the relevant consenting authority, including those at appeal and in some instances those currently at scoping when specifically requested (**proposed**).
- 5.71 The cumulative assessment considers the operational and under construction sites, as well as consented and proposed sites, and differs from that contained in the assessment of landscape effects and the assessment of visual effects in that it focuses specifically on the cumulative (additional) impact of the proposed development in association with all other wind energy developments, and assesses the detailed relationship between them.
- 5.72 Where the magnitude of change that would occur as a result of the introduction of the proposed development in the LVIA is identified as either low or barely perceptible, potential cumulative effects are scoped out of the cumulative assessment as it is considered that such an addition would not give rise to a significant cumulative effect.

Types of Cumulative Effects

- 5.73 Cumulative landscape effects can impact on either the physical fabric or character of the landscape, or any special values attached to it.
- 5.74 Three types of cumulative effects on visual amenity are considered in the assessment: combined, successive and sequential:
- **Combined effects** occur where a static viewer is able to view two or more wind farms from a viewpoint within the viewers' same arc of vision (assumed to be about 90 degrees for the purpose of the assessment);
 - **Successive effects** occur where a static viewer is able to view two or more wind farms from a viewpoint, but needs to turn to see them; and
 - **Sequential effects** occur when a viewer is moving through the landscape from one area to another, for instance when a person is travelling along a road or footpath, and is able to see two or more wind farms at the same, or at different times as they pass along the route. Frequently sequential effects occur where wind farms appear regularly, with short time lapses between points of visibility. Occasionally sequential effects occur where long periods of time

lapse between views of wind farms, depending on speed of travel and distance between viewpoints.

Assessing Cumulative Effects

Assessment Methodology for CLVIA

- 5.75 The CLVIA considers the potential effects of the addition of a proposed development, against a baseline landscape that includes wind farms that may or may not be present in the landscape in the future, i.e. wind farms that are consented but not yet built, and/or undetermined planning applications. The wind farms included in each scenario are assumed to be present in the landscape for the purposes of the CLVIA.
- 5.76 The methodology for the CLVIA follows that of the LVIA, which considers the introduction of a proposed development to a baseline which includes existing (operational and under construction) wind farms. The size and scale of cumulative change focuses on:
- the pattern and arrangement of wind farms in the landscape or 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 and number, and if wind farms appear balanced in views in terms of their composition, or at odds with one another;
 - the position of the wind farms in the landscape, e.g. in similar landscape or topographical context;
 - the position of the wind farms in the view, e.g. on the skyline or against the backdrop of land; or how the proposed development will be seen in association with another development (separate, together, behind etc.); and
 - the distances between wind farms, and their distances from the viewer.
- 5.77 For the purposes of this assessment, cumulative wind farms within the study area have been clustered into two distinct geographical groups: east and west. Their effects and interaction with the Proposed Development are therefore addressed as groupings, rather than individually. This reflects the fact that wind farms across similar areas and with similar characteristics will result in similar cumulative effects. Grouping them for assessment purposes avoids repetition. In the same way, where effects on LCTs, or viewpoints within the same area are likely to be very similar, they are drawn together and effects set out collectively.

Significance of Cumulative Effects

- 5.78 As for a LVIA, judging the significance of cumulative landscape and visual effects requires consideration of the sensitivity and the magnitude of effect on those receptors. The following sections set out the methodology applied for the assessment of cumulative effects for both landscape and visual receptors and explain the terms used.

Assessing Cumulative Landscape Effects

Sensitivity

5.79 An assessment of cumulative landscape effects requires consideration of the sensitivity of the landscape receptors. This requires consideration of susceptibility and value, and is as recorded in the LVIA.

Magnitude of Cumulative Landscape Effects

5.80 Similarly to the methodology applied for an LVIA, the magnitude of cumulative landscape effect (nature of cumulative landscape effect) is based on combining professional judgements on size and scale, geographical extent, duration and reversibility. Judgements on the magnitude of cumulative landscape effect (nature of cumulative visual effect) are recorded as **high, medium** or **low**.

Size and Scale

5.81 The size/scale of cumulative landscape change is the additional influence the proposed development has on the characteristics and character of the area assuming the other wind farm developments considered in the CLVIA baseline scenarios are already present in the landscape. This is influenced by:

- how the proposal fits with existing pattern of cumulative wind farm development, including the relationship to landscape character types and areas; and
- the siting and design of the proposed development in relation to other existing and proposed wind farm developments (including distance between wind farms, composition, size and scale).

Geographical Extent

5.82 As for the LVIA, the geographical extent over which the cumulative landscape change will be experienced is described as being **large** (scale of the landscape character type, or widespread, affecting several landscape types or character areas), **medium** (immediate surroundings) or **small** (site level).

Duration & Reversibility

5.83 For the purpose of the cumulative landscape assessment consideration of the judgements of the duration and reversibility of landscape effects are as recorded in the LVIA.

5.84 Judgements on the magnitude of cumulative landscape effect are recorded as **high, medium** or **low**.

Levels of Cumulative Landscape Effect and Significance

5.85 The final step in the assessment of cumulative landscape effects requires the judgements of sensitivity and magnitude of cumulative landscape effect to be combined to make an informed professional assessment on the significance of each cumulative landscape effect.

5.86 As for the LVIA the levels of cumulative landscape effect are described as **negligible, minor, moderate** or **major** where moderate and major cumulative landscape effects are considered **significant** in the context of the EIA Regulations.

5.87 More significant effects are likely where:

- the proposed development extends or intensifies a landscape effect;
- the proposed development ‘fills’ an area such that it alters the landscape resource; and / or
- the interaction between the proposed development and other wind farm developments means that the total effect on the landscape is greater than the sum of its parts.

5.88 GLVIA 3 states ‘The most significant cumulative landscape effects are likely to be those that would give rise to changes in the landscape character of the study area of such an extent as to have major effects on its key characteristics and even, in some cases, to transform it into a different landscape type. This may be the case where the project being considered itself tips the balance through its additional effects. The emphasis must always remain on the main project being assessed and how or whether it adds to or combines with the others being considered to create a significant cumulative effect’ (para 7.28 GLVIA 3).

5.89 This determination of cumulative landscape effects requires the application of professional judgement and experience to take on board the many different variables which need to be considered, and which are given different weight according to site-specific and location-specific considerations in every instance. Judgements are made on a case by case basis.

Assessing Cumulative Visual Effects

Sensitivity

5.90 The assessment of the significance of cumulative visual effects requires consideration of the sensitivity of the visual receptors. This requires consideration of susceptibility and value, and is as recorded in the LVIA.

Magnitude of Cumulative Visual Effects

5.91 As for cumulative landscape effects and the methodology for the LVIA, the magnitude of cumulative visual effect (nature of cumulative visual effect) is based on combining professional judgements on size and scale; geographical extent; duration and reversibility. Judgements on the magnitude of cumulative visual effect (nature of cumulative visual effect) are recorded as **high, medium, low** or **barely perceptible**.

Size and Scale

5.92 The size/scale of cumulative change to views depends on the additional influence the proposed development has on views assuming the other wind farm developments are already present in the landscape. This is influenced by:

- Whether the proposed development introduces development into a new part of the view so that the proportion of the developed part of the view increases;
- the relationship between the proposed development and other wind farm developments in terms of design, size and layout;
- the apparent visual relationship of cumulative wind farm developments to landscape character types and or landscape character areas; and / or
- in the case of magnitude of change to routes, the relative duration of views of wind farm developments from routes.

5.93 There has to be clear visibility of more than one wind farm development, of which one must be the proposed development, for there to be a cumulative effect (given this is an assessment of the effects of the proposed development and not a broader CLVIA of combined cumulative effects or capacity study). Where the proposed development is clearly visible and other wind farm developments are not, the effect is likely to be the same as recorded in the LVIA (i.e. the effect is not a cumulative effect).

Geographical Extent

5.94 As for the LVIA, the geographical extent of cumulative 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 wind farm can be glimpsed, or whether it represents a large area from which similar views are gained from large areas. Geographical extent is described as being **large, medium or small**.

Duration & Reversibility

5.95 For the purpose of the cumulative visual assessment consideration of the judgements of the duration and reversibility of visual effects are as recorded in the LVIA.

Levels of Cumulative Visual Effect and Significance

5.96 The final step in the assessment of cumulative visual effects requires the judgements of sensitivity and magnitude of cumulative visual effect to be combined to make an informed professional assessment on the significance of each cumulative visual effect.

5.97 As for the LVIA the levels of cumulative visual effect are described as **negligible, minor, moderate or major** where moderate and major cumulative visual effects are considered **significant** in the context of the EIA Regulations.

5.98 The evaluations of susceptibility, value, size and scale, geographical extent, duration and reversibility are considered together to provide an overall profile of each identified visual effect. An overview is taken of the distribution of judgements for each aspect to make an informed professional assessment of the overall level of each visual effect, drawing on guidance provided in GLVIA3. Levels of effect are identified as **negligible, minor, moderate**

or **major** where moderate and major visual effects are considered significant in the context of the EIA Regulations.

5.99 More significant effects are likely where:

- the proposed development extends or intensifies a visual effect;
- the proposed development ‘fills’ an area such that it alters the view/ visual amenity;
- the interaction between the proposed development and other developments means that the total visual effect is greater than the sum of its parts; and / or
- the proposed development will lengthen the time over which effects are experienced (sequential effects).

5.100 This determination of cumulative visual effects requires the application of professional judgement and experience to take on board the many different variables which need to be considered, and which are given different weight according to site-specific and location-specific considerations in every instance. Again, as for the assessment of landscape and visual effects, judgements are made on a case by case basis, guided by the same principles as set out in **Diagram 1** above.

Preparation of Visualisations

Viewpoint Photography

5.101 Photography for assessment viewpoints was taken between winter and spring 2022 using a Canon EOS 6D/ Nikon D750 full frame digital SLR camera, with a fixed 50mm focal length lens. The methodology for photography is in accordance with guidance from SNH⁷ and THC⁸.

5.102 A tripod with vertical and horizontal spirit levels was used to provide stability and to ensure a level set of adjoining images. 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 degrees at each viewpoint. Fifteen photographs were taken for each 360 degree view.

5.103 The location of each viewpoint was recorded (GPS grid reference, location map and photograph of the tripod) in accordance with SNH and Landscape Institute guidance⁹.

5.104 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.

Photograph Stitching, Wireframes and Photomontages

5.105 Photography stitching software (PTGui©) was used to stitch together the adjoining images to form panoramic images in cylindrical projection.

⁷ Scottish Natural Heritage (2006) and Version 2.2 (2017) Visual Representation of Windfarms: Good Practice Guidance.

⁸ The Highland Council (2016) Visualisation Standards for Wind Energy Developments;

⁹ Landscape Institute. (2011). Practice Advice Note, Photography and photomontage in landscape and visual impact assessment. Advice Note 01/11.

- 5.106 The software package ReSoft© WindFarm version 4.2 was used to view the wind farm from selected viewpoints in wireframe format. OS Terrain 5 and OS Terrain 50 data were used to create a Digital Terrain Model (DTM) which provided a detailed and reliable representation of the topography for the wireframe view. Turbine locations, type and size, and viewpoint location coordinates were entered. Photomontages have been constructed to show the candidate turbine with the specified tip height, hub height and rotor diameter. Viewer height was set to 1.5m above ground level. On limited occasions this viewer height was increased by a small increment to achieve a closer match between the terrain data and photographic landform content. The pre-prepared panoramic photos were imported into the ReSoft© WindFarm software and the wireframe views overlaid and aligned with the photographs.
- 5.107 The presentation of fully rendered photomontages involved a number of additional stages as follows.
- 5.108 ReSoft© WindFarm software was used to render the turbines, taking account of the sunlight conditions and the position of the sun in the sky at the time the photograph was taken. Blade angle and orientation adjustments were also made to represent a realistic situation.
- 5.109 The next stage required the rendered turbines to be blended into the baseline photographic view. This was carried out using Adobe Photoshop© software and allowed, where relevant, for turbines or parts of turbines to be masked (removed) where they were located behind foreground elements that appeared in the original photograph. The software package 43D Topos© was used for adding the access tracks and other ancillary features. These elements were informed by infrastructure data either imported as a GIS shapefile or modelled in 3D to their specified dimensions and positioned within a DTM created from the same OS Terrain 5 and OS Terrain 50 data used for the turbine alignment and renders.
- 5.110 Views were rendered and exported images composited with the turbine renders and photographs to create the photomontages.
- 5.111 Finally, and where applicable, the images were converted from Cylindrical Projection to Planar Projection using PTGui© software.

Presentation of Photomontages

- 5.112 Two separate sets of photomontages for the viewpoints have been produced in accordance with NatureScot and THC to allow them to be used independently.

NatureScot Compliant Visualisations

- 5.113 Adobe InDesign© software was used to present the figures. The dimensions for each image (printed height and field of view) are in accordance with NatureScot requirements. Photography information and viewing instructions are provided on each page where relevant.
- 5.114 The elongated A1 width format pages presented for each viewpoint are set out as follows:
- The (up to 4 No.) pages contain 90° baseline photography and wireline to illustrate the wider landscape and visual context. These are shown in cylindrical projection and

- presented on an A1 width page. Additional pages in the same format are provided where relevant to illustrate wider cumulative visibility up to 360°; and
- Subsequent pages contain a 53.5° wirelines and photomontages. These images are both shown in planar projection and presented on an A1 width page.

THC Compliant Visualisations

- 5.115 Adobe InDesign software was used to present the figures. The dimensions for each image (printed height and field of view) are in accordance with THC requirements. Photography information and viewing instructions are provided on each page where relevant.
- 5.116 The A3 format pages for each viewpoint are set out as follows:
- The following two pages contain 65.5° panoramic images for landscape assessment. The panoramic photomontage is followed by the panoramic wireline and baseline photograph. These images are all shown in planar projection; and
 - The subsequent two pages contain the single frame images for visual impact assessment. The 50mm focal length photomontage precedes the 75mm focal length photomontage.