



# Technical Appendix 6.1

## Landscape and Visual Impact Assessment (LVIA) Methodology

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# LVIA Methodology

## 6.1 Introduction

1. This methodology has been prepared by chartered landscape architects at Optimised Environments Ltd (OPEN) and describes in detail the methodology that has been used to carry out the Landscape and Visual Impact Assessment (LVIA). The LVIA identifies and assesses the significance of changes resulting from the proposed Development on both the landscape as an environmental resource and on people's views and visual amenity.

### 6.1.1 Guidance

2. The following sources have been used in the formulation of methodology for the assessment and the presentation of visual representations:

- Landscape Institute with the Institute of Environmental Management and Assessment (2013). Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3);
- Carys Swanwick Department of Landscape University of Sheffield and Land Use Consultants for The Countryside Agency and Scottish Natural Heritage (2002). Landscape Character Assessment Guidance for England and Scotland;
- Scottish Natural Heritage (2012) Assessing the Cumulative Impact of Onshore Wind Energy Developments;
- Scottish Natural Heritage (2017). Assessing impacts on Wild Land Areas - Technical Guidance-Consultation Draft;
- Scottish Natural Heritage (2017) Siting and Designing Wind Farms in the Landscape Version 3a;
- Scottish Natural Heritage (2017). Visual Representation of Wind Farms, Version 2.2;
- Landscape Institute (2019) Technical Guidance Note 2/19 Residential Visual Amenity Assessment; and
- Landscape Institute (2019). Visual representation of Development Proposals: Landscape Institute Technical Guidance Note 06/19.

### 6.1.2 GLVIA3

3. OPEN's LVIA methodology accords with the guidance set out in the GLVIA3. Where it diverges from specific aspects of the guidance, in a small number of areas, reasoned professional justification for this is provided as follows.
4. GLVIA3 sets out an approach to the assessment of magnitude of change in which three separate considerations are combined within the magnitude of change rating. These are the size or scale of the effect, its geographical extent and its duration and reversibility. This approach is to be applied in respect of both landscape and visual receptors. OPEN considers that the process of combining all three considerations in one rating can distort the aim of identifying significant effects of windfarm development. For example, an increased magnitude of change, based on size or scale, may be reduced to a lower rating if it occurred in a localised area and for a short duration. This might mean that a potentially significant effect would be overlooked if effects are diluted down due to their geographical extents and/or duration or reversibility.
5. OPEN has chosen to keep these the consideration of the size or scale of the effect, its geographical extent and its duration and reversibility separate, by basing the magnitude of change on size or scale to determine where significant and not significant effects occur, and then describing the geographical extents of these effects and their duration and reversibility separately. Duration and reversibility are stated separately in relation to the assessed effects (i.e. as short/medium/long-term and temporary/permanent) and are considered as part of drawing conclusions about significance, combining with other judgements on sensitivity and magnitude, to allow a final judgement to be made on whether each effect is significant or not significant.

### 6.1.3 Information and data sources

6. The assessment is initiated through a desk study of the Site and the LVIA Study Area. This desk study identifies aspects of the landscape and visual resource that are considered in the LVIA, including landscape related planning designations (i.e. National Scenic Areas, NSAs), landscape character typology, wild land areas (WLAs), operational

and potential cumulative windfarms, and views from routes (including roads, railway lines, National Cycle Routes and long distance walking routes), and settlements.

7. The desk study utilises Geographic Information System (GIS) and Resoft Wind farm software to explore the potential visibility of the proposed Development. The resultant ZTV diagrams and wirelines provide an indication of which landscape and visual receptors are likely to be key in the assessment.
8. Settlements are identified using Local Development Plans within the Study Area and have been identified using the following sources: Dumfries and Galloway Council, LDP Technical Paper – Settlement Hierarchy, 2014. Landscape characterisation information and data has also been obtained from the following sources: South Ayrshire Landscape Wind Capacity Study (Aug 2018); Dumfries and Galloway LDP SPG Wind Energy Development Landscape Capacity Study (June 2017); and North Ayrshire Supplementary Landscape Wind Capacity Study (June 2013).

### 6.1.4 Study Area

9. The definition of a Study Area for the LVIA is an important and established part of LVIA, which is recommended in LVIA guidance (Landscape Institute, 2013 and SNH, 2017).
10. The LVIA Study Area is defined based on guidance, relevant legislation, consultation feedback, the ZTV for the proposed Development and the emerging findings of the LVIA to ensure that is an appropriate Study Area based on the threshold of significance, defining an outer limit within which significant effects could occur. Guidance developed by SNH (Visual Representation of Windfarms Version 2.2, February 2017) indicates that an area with a radius of 45 km from the nearest turbine is appropriate for the turbines of the size proposed in the proposed Development. The majority of landscape and visual receptors between 20 km and 45 km are outwith the coverage of the ZTV, where theoretical visibility is shown on the ZTV potentially significant effects are limited by distance, intervening woodland or forestry. From locations within these areas the proposed Development would be seen on the skyline in the immediate context of other operational windfarms visible at closer range. Due to the nature of the proposed Development as an extension of an operational windfarm and the wider context that includes other windfarms significant effects are likely to be restricted to a more localised Study Area. Furthermore, some of the changes to the landscape that have occurred, primarily through windfarm development within the area, have altered the local landscape character context. Taking this into account and in order to focus the assessment on potential for significant effects, the LVIA has focussed its assessment within a 20 km Study Area, hereafter referred to as the 'Study Area'.
11. The rationale for the LVIA Study Area is also explained in **Section 6.4.1 of Chapter 6** in the EIAR ('Study Area') shown on **Figure 6.1a** and on all LVIA plan figures in the EIAR. A 45km search area is defined for consideration of potential receptors and cumulative wind farms, within which a 20km radius detailed cumulative Study Area is defined as appropriate for the cumulative assessment. The rationale for the cumulative assessment Study Area is explained in more detail in **Section 6.7** of this Technical Appendix.

## 6.2 Types of Landscape and Visual Effects

12. The LVIA is intended to determine the effects that the proposed Development would have on the landscape and visual resource.
13. For the purpose of assessment, the potential effects on the landscape and visual resource are grouped into three categories: landscape effects, visual effects and cumulative landscape and visual effects, each of which is briefly described as follows.

**6.2.1 Landscape Effects**

14. The LVIA considers the effects of the proposed Development on the landscape as a resource. Landscape effects are either direct effects on the physical fabric of the site, or effects on landscape character. The assessment of landscape effects is carried out as follows:

- Assessment of physical effects: physical effects are direct effects on the physical fabric of the site, such as the removal of trees and alteration to ground cover. This category of effects is made up of landscape elements, which are the components of the landscape such as hedgerows or woodland that may be physically affected by the proposed Development.
- Assessment of effects on landscape character: landscape character is the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and the way that this pattern is perceived. Effects on landscape character arise either through the introduction of new elements that alter this pattern of elements, or through visibility of the proposed Development, which may alter the way in which the pattern of elements is perceived. This category of effects is considered in terms of landscape character receptors, which fall into two groups; landscape character types/areas and landscape designations.

**6.2.2 Visual Effects**

15. The LVIA considers the effect of the proposed Development on views and visual amenity. Visual effects include effects on visual receptors, i.e. groups of people that may experience an effect, and views (viewpoints). The visual assessment is carried out as follows:

- An assessment of the effects of the proposed Development on views from principal visual receptors, including residents of settlements, motorists using roads, people using recreational routes, features and attractions throughout the Study Area (as ascertained through the baseline study); and
- An assessment of the effects of the proposed Development on representative viewpoints that have been selected to assess the effect on locations relevant to these visual receptors and from specific viewpoints, chosen because they are key or promoted viewpoints in the landscape.

**6.2.3 Cumulative Effects**

16. Cumulative landscape and visual effects arise where the study areas for two or more windfarms overlap so that both are experienced at proximity where they may have a greater incremental effect, or where wind energy developments may combine to have a sequential effect, irrespective of any overlap in study areas. This means that the addition of the proposed Development to a situation where other windfarms are apparent in the baseline or a potential future baseline landscape and visual context may result in a greater effect than where the proposed Development is seen in isolation. The main assessment of the effects of the proposed Development takes into account its addition to a baseline landscape that contains the operational/under construction windfarms.

17. The likely significant cumulative effects of the proposed Development are assessed in relation to two relevant potential future baseline scenarios as set out in section 6.7.

**6.2.4 Significance of effects**

18. The objective in assessing the effects of the proposed Development is to predict the significant effects of the proposed Development on the landscape and visual resource. In accordance with the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (the EIA Regulations) the LVIA effects are assessed to be either significant or not significant and does not define intermediate levels of significance as the Regulations do not provide for these.

19. The significance of effects is assessed through a combination of two considerations: the sensitivity to change of the landscape element, landscape character receptor or visual receptor; and the magnitude of change that would result from the proposed Development.

20. OPEN's methodology requires the application of professional judgement in accordance with the Landscape Institute's GLVIA3. Although it is not reliant on the use of a matrix, the following matrix (

21. **Table 6.2-1**) has been included to illustrate how combinations of the ratings for sensitivity and magnitude of change can give rise to significant effects, as well as to give an understanding of the threshold at which significant effects may arise.

22. OPEN has chosen to keep these the consideration of the size or scale of the effect, its geographical extent and its duration and reversibility separate, by basing the magnitude of change on size or scale to determine where significant and not significant effects occur, and then describing the geographical extents of these effects and their duration and reversibility separately. Duration and reversibility are therefore stated separately in relation to the assessed effects (i.e. as short/medium/long-term and temporary/permanent) and are considered as part of drawing conclusions about significance, combining with other judgements on sensitivity and magnitude, to allow a final judgement to be made on whether each effect is significant or not significant.

Table 6.2-1 Illustrative Significance Matrix

Sensitivity \ Magnitude	Magnitude					
	High	Medium-High	Medium	Medium-Low	Low	Negligible
High	Significant	Significant	Significant	Significant or not significant	Not significant	Not significant
Medium-High	Significant	Significant	Significant or not significant	Significant or not significant	Not significant	Not significant
Medium	Significant	Significant or not significant	Significant or not significant	Not significant	Not significant	Not significant
Medium-Low	Significant or not significant	Significant or not significant	Not significant	Not significant	Not significant	Not significant
Low	Not significant	Not significant	Not significant	Not significant	Not significant	Not significant

26. Effects that are assessed within the dark grey boxes in the matrix are assessed to be significant in terms of the requirements of the EIA Regulations. Those effects that are assessed within the light grey boxes may be significant, or not significant, depending on the specific factors and effect that is assessed in respect of a particular landscape or visual receptor. Experienced professional judgement is applied to the assessment of all effects and reasoned justification is presented in respect of the findings in each case.

27. Significant effects occur where the proposed Development would provide a defining influence on a landscape element, landscape character receptor or view; or where changes of a lower magnitude occur on a landscape element, landscape character receptor or view that is of particularly high sensitivity. A not significant effect occurs where the effect of the proposed Development is not material, whereby the baseline characteristics of the landscape element, landscape character receptor or view continue to provide the definitive influence, or where the small scale of change experienced by a high sensitivity receptor is such as to be considered not significant.

28. Significant cumulative effects occur where the addition of the proposed Development to the baseline under consideration (which may include other wind energy developments), leads to windfarms becoming a prevailing

landscape and visual characteristic or where the proposed Development adversely contrasts with the scale or design or an existing or proposed Development.

## 6.3 Assessment of Landscape Effects

29. Landscape character is the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and the way that this pattern is perceived. Effects on landscape character arise either through the introduction of new elements that physically alter this pattern of elements, or through visibility of the proposed Development, which may alter the way in which the pattern of elements is perceived. This category of effects is made up of physical effects and effects on landscape character (landscape character types and designated areas).

### 6.3.1 Assessment of Physical Effects

30. The physical effects of the proposed Development are restricted to the area of the site where existing landscape elements may be changed. Physical effects are the direct effects as a result of the proposed Development on the fabric of the site, such as the removal of trees and alteration to ground cover. The objective of the assessment of physical effects is to determine what the likely physical effects of the proposed Development would be, which landscape elements would be affected, and whether these effects would be significant or not significant. The variables considered in the sensitivity of landscape elements and the magnitude of change that the proposed Development would have on them are described as follows.

#### 6.3.1.1 Sensitivity of Landscape Elements

31. The sensitivity of a landscape element is an expression of its value and quality, and the potential to mitigate the effect.
- the value of a landscape element is a reflection of its importance in the pattern of elements which constitute the landscape character of the area. For example, the value of woodland is likely to be increased if it provides an important component of the local landscape character. If a landscape element is particularly rare, as a remnant of an historic landscape layout for example, its value is likely to be increased; and
  - the susceptibility of a landscape element is a reflection of the degree to which the element can be restored, replaced or substituted. For example, it may be possible to restore ground cover following the excavation required for the building of turbine foundations, and this would reduce the sensitivity of this element.
32. The evaluation of sensitivity is described for each receptor in the assessment. Levels of sensitivity: high, medium-high, medium, medium-low and low, are applied. The sensitivity of each receptor is a product of the specific combination of value, quality and potential for mitigation as evaluated by professional judgement.

#### 6.3.1.2 Magnitude of Change on Landscape Elements

33. The magnitude of change on landscape elements is quantifiable and is expressed in terms of the degree to which a landscape element would be removed or altered by the proposed Development, the extent of existing landscape elements that would be lost and the contribution of that element to the character of the landscape. Definitions of magnitude of change are applied in order that the process of assessment is made clear. These are:
- **High**, where the proposed Development would result in the complete removal or substantial alteration of a landscape element;
  - **Medium**, where the proposed Development would result in the removal of a notable part of a landscape element or a notable alteration to a landscape element;
  - **Low**, where the proposed Development would result in the removal of a minor part of a landscape element or a minor alteration to a landscape element;
  - **Negligible**, where the proposed Development would result in the removal of a negligible amount of a landscape element or is barely discernible; and
  - **None**, where the proposed Development would result in no change to the landscape element.
34. There may also be intermediate levels of magnitude of change, such as medium-high or medium-low, where the change falls between definitions.

### 6.3.1.3 Significance of Effects on Landscape Elements

35. The significance of the effect on landscape elements is dependent on all of the factors considered in the sensitivity of the receptor and the magnitude of change upon it, and by applying professional judgement to assess whether or not the proposed Development would have an effect that is significant or not significant.
36. A significant effect would occur where the degree of removal or alteration of the landscape element is such that the landscape element would be redefined (although the landscape character may not necessarily be redefined). If the landscape element is of a high sensitivity, a significant effect can occur with a limited degree of removal or alteration. A not significant effect would occur where the form of the landscape element is not redefined as a result of the proposed Development. If the landscape element is of lower sensitivity, it may undergo a higher level of removal or alteration yet remain as a not significant effect.

### 6.3.2 Assessment of Effects on Landscape Character

37. The objective of the assessment of effects on landscape character is to determine what the likely effects of the proposed Development would be, which landscape character receptors would be affected, and whether these effects would be significant or not significant. The methodology for the assessment of effects on landscape character involves the undertaking of a baseline study, evaluation of sensitivity, magnitude of change and an assessment of significance.

#### 6.3.2.1 Landscape Baseline and Scope Assessment

38. The landscape baseline provides an understanding of the landscape in the area that may be affected - its constituent elements, its character, distinctiveness, condition and value, and the way this varies spatially. The landscape baseline describes aspects of the landscape that may be significantly affected, as defined in Schedule 4 of the EIA Regulations. Establishing the landscape baseline will, when reviewed alongside the description of the proposed Development, form the basis for the identification and description of the landscape effects of the proposed Development. The baseline description of the landscape that may be affected is primarily determined by the physical footprint of the proposed Development components and their ZTV.
39. An overview of the landscape baseline is described and a scope assessment identifies landscape receptors that may experience significant effects, which require to be assessed in full. A detailed description of the baseline is provided for each landscape receptor that may experience significant effects, allowing the full baseline to be described for landscape receptors that may be significantly affected. Those receptors which are identified as not having the potential to undergo significant effects and significant cumulative effects, are not included in the subsequent detailed assessment, but are noted with reasons given for their exclusion.
40. The baseline study of each landscape character receptor collates and presents information relevant to the assessment drawn from a combination of desk study and fieldwork. The baseline study covers the following issues:
- the description of the landscape character receptor drawn from the relevant documentation such as the Landscape Character Assessment or citations in respect of landscape designations;
  - a description of the landscape character receptor based on field work to determine how typical or not the landscape character receptor is in relation to documented descriptions;
  - those features and patterns of the landform, land-cover and land use which make the landscape character receptor distinctive;
  - the visual and sensory experience of the landscape and how it associates with other landscapes including in particular the landscape character receptor where the proposed Development is located; and
  - how change in this landscape character receptor, either through natural or human processes, is presently affecting character and how they are predicted to affect character in the future. This may include operational windfarms where they are a feature of the baseline landscape context.
41. The landscape baseline also describes current pressures that may cause change in the landscape in the future, in particular drawing on information for wind energy developments that are not yet present in the landscape but are at other stages in the proposed Development and consenting process. Operational and under construction wind energy developments are regarded as part of the baseline landscape character of the area. Any changes resulting from the proposed Development are assessed within this context in the assessment of landscape and visual effects.

**6.3.2.2 Sensitivity of Landscape Character Receptors**

42. The sensitivity of a landscape character receptor is an expression of the combination of the judgements made about the susceptibility of the receptor to the specific type of change or the development proposed and the value related to that receptor.

**6.3.2.3 Value of the Landscape Receptor**

43. The value of a landscape character receptor is a reflection of the value which society attaches to that landscape. The assessment of the landscape value is classified as high, medium-high, medium, medium-low or low and the basis for this assessment is made clear using evidence and professional judgement, based on the following range of factors:

- **Landscape designations:** A receptor that lies within the boundary of a recognised landscape related planning designation will be of increased value, depending on the proportion of the receptor that is covered and the level of importance of the designation; international, national, regional or local. It is important to note that the absence of designations does not preclude local resource value, as an undesignated landscape character receptor may be important as a resource in the local or immediate environment, particularly when experienced in comparison with other nearby landscapes.
- **Landscape quality:** The quality of a landscape character receptor is a reflection of its attributes, such as scenic quality, sense of place, rarity and representativeness and the extent to which these attributes have remained intact. A landscape with consistent, intact and well-defined, distinctive attributes is generally considered to be of higher quality and, in turn, higher value, than a landscape where the introduction of inappropriate elements has detracted from its inherent attributes.
- **Landscape experience:** The experience of the landscape character receptor can add to its value and relates to a number of factors including the perceptual responses it evokes, the cultural associations that may exist in literature or history, or the iconic status of the landscape in its own right, the recreational value of the landscape for outdoor pursuits, and the contribution of other values relating to the nature conservation or archaeology of the area.

**6.3.2.4 Susceptibility to Change**

44. The susceptibility of a landscape character receptor to change is a reflection of its ability to accommodate the changes that would occur as a result of the addition of the proposed Development. The assessment of the susceptibility of the landscape receptor to change is classified as high, medium-high, medium, medium-low or low and the basis for this assessment is made clear using evidence and professional judgement, based on the following criteria:

- **The specific nature of the proposed Development:** The susceptibility of landscape receptors is assessed in relation to change arising from the specific development proposed, including the specific components and features of the proposed Development proposed, its size, scale, location, context and characteristics.
- **Landscape character:** The key characteristics of the existing landscape character of the receptor is considered in the evaluation of susceptibility as, they determine the degree to which the receptor may accommodate the influence of the proposed Development. For example, a landscape that is of a particularly wild and remote character may have a high susceptibility to the influence of the proposed Development due to the contrast that it would have with the landscape, whereas a developed, industrial landscape, where built elements and structures are already part of the landscape character, may have a lower susceptibility. However, there are instances when the quality of a landscape may have been degraded to an extent whereby it is considered to be in a fragile state and therefore a degraded landscape may have a higher susceptibility to the proposed Development.
- **Landscape association:** The extent to which the proposed Development would influence the character of the landscape receptors across the Study Area, relates to the associations that exist between the landscape receptor where the proposed Development is located and the landscape receptor from which the proposed Development is being experienced. In some situations this association would be strong where the landscapes are directly related, for example the influence on a valley landscape by an enclosing upland landscape where the proposed Development is set along the skyline, and in other situations weak where the landscape association is less important; for example, where the proposed Development lies inland of a coastal landscape that has its main focus outwards over the sea.

**6.3.2.5 Sensitivity Rating**

45. An overall sensitivity assessment of the landscape receptor is made by combining the assessment of the value of the landscape character receptor and its susceptibility to change. An overall level of sensitivity is applied for each landscape receptor: high, medium-high, medium, medium-low and low; by combining individual assessments of the

value of the receptor and its susceptibility to change. The basis for the assessments is made clear using evidence and professional judgement in the evaluation of sensitivity for each receptor. Criteria that tend towards higher or lower sensitivity are set out in **Table 6.3-1**.

Table 6.3-1 Sensitivity to Change – Seascape/Landscape Receptors

Criteria tending towards higher or lower sensitivity		
	High → Medium → Low	
<b>Value</b>	Designated landscapes with national policy level protection or defined for their natural beauty. Higher quality landscapes with consistent, intact and well-defined, distinctive attributes. Rare or unique landscape character types or features. Aesthetic or perceptual aspects of designated wildlife, ecological or cultural heritage features that contribute to landscape character. Evidence that the landscape is valued or used substantially for recreational activity. Landscape with perceptual qualities of wildness, remoteness or tranquillity. Landscape with strong cultural associations that contribute to perceptions of scenic quality.	Landscapes without formal designation. Despoiled or degraded landscape with little or no evidence of being valued by the community. Lower quality landscapes with indistinct elements or features that detract from its inherent attributes. Widespread or 'common' landscape character types or features. Limited or no wildlife, ecological or cultural heritage features, or limited contribution to landscape character. No evidence that the landscape is used for recreational activity. Landscape with inherent character has been changed by human activity. Landscape with few cultural associations.
<b>Susceptibility to Change</b>	Landscape which is likely or liable to be influenced by the proposed Development. Landscape vulnerable or fragile to change through the loss or addition of features that would alter key landscape characteristics. Landscape which lacks the ability to resist/accommodate the change that is likely to occur as a result of the proposed Development. Landscape of high quality/in good condition. Aesthetic or perceptual aspects of landscape are susceptible to changes associated with features of proposed Development. Strong or direct association between proposed Development and the landscape receptor. Landscape which is directly exposed to the proposed Development and has highest degree of exposure.	Landscape which is unlikely or not liable to be influenced by the proposed Development. Robust landscape, able to accommodate change or loss of features without altering key characteristics. Landscape which has the ability to resist/accommodate the change that is likely to occur as a result of the proposed Development. Landscape of low quality/in poor condition. Aesthetic or perceptual aspects of landscape may accommodate changes associated with features of proposed Development. Weak and indirect association between proposed Development and the landscape receptor. Landscape which is not directly exposed to the proposed Development and has degree of concealment/screening.
<b>Sensitivity to Change</b>	High → Medium → Low	

**6.3.3 Magnitude of Change on Landscape Character Receptors**

46. The magnitude of change on views is an expression of the scale of the change that would result from the proposed Development, and is dependent on a number of variables regarding the size or scale of the change. An assessment is also made of the geographical extent of the area over which this would occur and the duration and reversibility of such changes. The basis for this assessment is made clear using evidence and professional judgement, based on the following criteria.

**6.3.3.1 Size or Scale of Change**

47. This criterion relates to the size or scale of change to the landscape that would arise as a result of the proposed Development, based on the following factors:

- The degree to which the pattern of elements that makes up the landscape character would be altered by the Development, through removal or addition of elements in the landscape, in this instance. The magnitude of change would generally be higher if key features that make up the landscape character are extensively removed or altered, and if many new components are added to the landscape;
- The extent to which the Development would change, physically or perceptually, the characteristics that may be important in the creation of the distinctive character of the landscape. This may include the scale of the landform, its relative simplicity or irregularity, the nature of the landscape context, the grain or orientation of the landscape, the degree to which the receptor is influenced by external features and the juxtaposition of the Development with these key characteristics;
- The degree to which landscape character receptors would be changed by the addition of the Development in place of or in addition to baseline wind energy developments that are already present in the landscape. If the Development is located in a landscape receptor that is already affected by wind energy development, this may reduce the magnitude of change, particularly if there is a high level of integration and the developments form a unified and cohesive feature in the landscape. The converse could also be applicable;
- The landscape context in which the Development and other wind energy development are located. If the Development is located in a similar landscape context, the magnitude of change is likely to be lower as they relate consistently to key landscape characteristics. If developments are located in different landscape settings, this can lead to a perception that wind energy development is unplanned and uncoordinated, affecting a wide range of landscape characters and blurring the distinction between them;
- The scale of the landscape, landform and patterns of the landscape. A large-scale landscape can provide a more appropriate receiving environment than a more intimate, small-scale setting where development may result in uncomfortable scale comparisons and increase the magnitude of change;
- The distance between the landscape character receptor and the Development. Generally, the greater the distance, the lower the scale of change as the Development would constitute a less apparent influence on the landscape character;
- The extent of the Development that would be seen from the landscape receptor. Visibility of the Development may range from one turbine blade tip to all of the turbines, and generally the greater the extent of the Development that can be seen, the greater the change.

### 6.3.3.2 Geographical Extent

48. The geographic extent over which the landscape effects would be experienced is also assessed, which is distinct from the size or scale of effect. This evaluation is not combined in the assessment of the level of magnitude, but instead expresses the extent of the receptor that would experience a particular magnitude of change and can therefore affect the geographical extents of the significant and non-significant effects.
49. The extent of the effects would vary depending on the specific nature of the proposed Development and is principally assessed through analysis of the extent of visibility of physical change to the landscape or the extent to which the landscape character would change through visibility of the proposed Development.

### 6.3.3.3 Duration and Reversibility

50. The duration and reversibility of landscape effects are based on the period over which the proposed Development is likely to exist and the extent to which the proposed Development would be removed and its effects reversed at the end of that period. Duration and reversibility are not incorporated into the overall magnitude of change, and are stated separately in relation to the assessed effects.

### 6.3.3.4 Magnitude of Change Rating

51. An overall assessment of the magnitude of change resulting from the proposed Development on the landscape receptor is made by combining the assessments of size or scale of change and geographical extent. The basis for the assessment of magnitude for each receptor is made clear using evidence and professional judgement. The levels of magnitude of change that can occur are defined as follows:
- **High**, the proposed Development would result in a major alteration to the baseline characteristics of the landscape, providing the prevailing influence and/or introducing elements that are uncharacteristic in the receiving landscape;
  - **Medium**, the proposed Development would result in a moderate alteration to the baseline characteristics of the landscape, providing a readily apparent influence and/or introducing elements potentially uncharacteristic in the receiving landscape;
  - **Low**, the proposed Development would result in a minor alteration to the baseline characteristics of the landscape, providing a slightly apparent influence and/or introducing elements that are characteristic in the receiving landscape;

- **Negligible**, the proposed Development would result in a negligible alteration to the baseline characteristics of the landscape, providing a barely discernible influence and/or introducing elements that are substantially characteristic in the receiving landscape; and
- **None**, the proposed Development would result in no change to the baseline characteristics of the landscape.

52. There may also be intermediate levels of magnitude of change, such as medium-high and medium-low, where the change falls between definitions. Criteria that tend towards higher or lower magnitude of change are set out in **Table 6.3-2**.

Table 6.3-2 Magnitude to Change Criteria – Landscape Receptors

Criteria tending towards higher or lower magnitude		
	High → Medium → Low → Negligible	
<b>Size or scale of change</b>	<p>Major loss of existing landscape elements which contribute to the landscape character.</p> <p>Major alteration to pattern of elements, or perception of landscape pattern, through removal or addition of landscape elements.</p> <p>Major change to key characteristics which define the distinctive character of the landscape.</p> <p>Proposed Development located within or close to landscape receptor and results in large scale change to its landscape character.</p> <p>Large amount of proposed Development visible resulting in higher scale of change.</p> <p>Proposed Development contrasts with other existing windfarms in pattern, scale and relationship to key characteristics, creating a confusing or inconsistent image or relationship to key characteristics.</p>	<p>Minor or negligible loss of existing landscape elements.</p> <p>Minor alteration to pattern of elements, or perception of landscape pattern.</p> <p>Minor change to key characteristics, or changes to characteristics which are not part of inherent distinctiveness.</p> <p>Proposed Development located at long distance outside landscape receptor and result in small scale change to its landscape character.</p> <p>Small amount of proposed Development visible resulting in lower scale of change.</p> <p>Proposed Development consolidates existing windfarms, relates consistently to a key characteristic of the landscape and/or has a high level of integration forming a unified and cohesive feature in the landscape.</p>
<b>Magnitude of Change</b>	High → Medium → Low → Negligible	

### 6.3.4 Significance of Effects on Landscape Character Receptors

53. The significance of the effect on each landscape character receptor is dependent on all of the factors considered in the sensitivity of the receptor and the magnitude of change resulting from the proposed Development. These judgements on sensitivity and magnitude are combined to arrive at an overall assessment as to whether the proposed Development would have an effect that is significant or not significant on the landscape character receptor. An assessment of the factors considered in the evaluation of the sensitivity of each landscape character receptor and the magnitude of the change resulting from the proposed Development are presented in the assessment in order that the relevant considerations which have informed the significance can be considered transparently. The matrix shown in **Table 6.2-1** helps to inform the threshold of significance when combining sensitivity and magnitude to assess significance.
54. A significant effect would occur where the combination of the variables results in the proposed Development having a defining effect on the landscape character receptor, or where changes of a lower magnitude occur on a landscape character receptor that is of particularly high sensitivity. A not significant effect would occur where the effect of the proposed Development is not definitive, and the landscape character of the receptor continues to be characterised principally by its baseline characteristics, or where the small scale of change experienced by a high sensitivity receptor is such as to be considered not significant. A major loss or irreversible effect over an extensive area, on elements and/or perceptual aspects that are key to the character of nationally valued landscapes are likely to be of greatest significance. Reversible effects, over a restricted area, on elements and/or perceptual aspects that

contribute to but are not key characteristics of the character of landscapes that are of lower value, are likely to be of least significance.

55. OPEN has chosen to keep these the consideration of the size or scale of the effect, its geographical extent and its duration and reversibility separate, by basing the magnitude of change on size or scale to determine where significant and not significant effects occur, and then describing the geographical extents of these effects and their duration and reversibility separately. Duration and reversibility are therefore stated separately in relation to the assessed effects (i.e. as short/medium/long-term and temporary/permanent) and are considered as part of drawing conclusions about significance, combining with other judgements on sensitivity and magnitude, to allow a final judgement to be made on whether each effect is significant or not significant.

## 6.4 Assessment of Visual Effects

56. The assessment of visual effects is an assessment of how the introduction of the proposed Development would affect the views available to people and their visual amenity. The assessment of visual effects is carried out in two parts:

- an assessment of the effects that the proposed Development would have on a series of viewpoints that have been selected to represent the views available to people from representative or specific locations within the Study Area; and
- an assessment of the effects that the proposed Development would have from principal visual receptors, including residents of settlements, motorists using roads and people using recreational routes, features and attractions throughout the Study Area.

57. The objective of the assessment of effects on visual receptors is to determine what the likely effects of the proposed Development would be on the people experiencing views across the Study Area, and whether these effects would be significant or not significant. The methodology for the assessment of visual effects involves the undertaking of a baseline study, evaluation of sensitivity, magnitude of change and an assessment of significance.

### 6.4.1 Visual Baseline and Scope Assessment

58. The visual baseline establishes the area in which the proposed Development may be visible, the different groups of people who may experience views of the proposed Development, the viewpoints where they would be affected and the nature of the views at those points. The visual baseline describes aspects of the visual amenity that may be significantly affected, as defined in Schedule 4 of the EIA Regulations. The baseline description of the groups of people (referred to as visual receptors) and viewpoints that may be affected is primarily determined by the ZTV.

59. An overview of the visual baseline is described, and a scope assessment identifies visual receptors that may experience significant effects, which require to be assessed in full. A full description of the baseline is provided for each visual receptor that may experience significant effects, allowing the full baseline to be described for visual receptors that may be significantly affected. Those receptors which are identified as not having the potential to undergo significant effects are not included in the subsequent detailed assessment but are noted with reasons given for their exclusion.

60. The baseline study establishes the visual baseline, including the area from which the proposed Development may be visible, the different groups of people who may experience views of the proposed Development (visual receptors), the viewpoints where they would be affected and nature of views at these points. The baseline study establishes the visual baseline in relation to the following matters:

- the area from which the proposed Development may be visible, that is land from which it may potentially be seen, is established and mapped using an initial ZTV of the proposed Development;
- the location, type and number of visual receptors experiencing visibility of the proposed Development, the likely views experienced and the activity / occupation they are engaged in;
- selection of viewpoints from within the ZTV, including representative viewpoints selected to represent the experience of different types of visual receptor and specific viewpoints selected because they are key/promoted viewpoints in the landscape;

- the location, character and type of each viewpoint with an indication of the type of visual receptor likely to be experiencing the view from each viewpoint;
- the nature of the view in terms of both the direction of view towards the proposed Development as well as the wider available view, making reference to the principal orientation, focal features, and visible extents in terms of both horizontal degrees and distance;
- the character of the view in terms of its content and composition, its horizontal and vertical scale as well as depth and sense of perspective, important attributes such as prominent skylines and focal points and ultimately identifying the defining patterns and features which characterise the view; and
- the influence of human intervention and how the addition of artefacts and modification through land use affect the baseline situation. This may include operational windfarms where they are a feature of the baseline visual context.

61. The visual baseline also describes current pressures that may cause change to the visual amenity of the area in the future, in particular drawing on information for wind energy developments that are not yet present in the landscape but are at other stages in the project and consenting process. Operational and under construction wind energy developments are regarded as part of the baseline visual context. Any changes resulting from the proposed Development are assessed within this context in the assessment of landscape and visual effects.

### 6.4.2 Sensitivity of Visual Receptors

62. The sensitivity of visual receptors is determined by a combination of the value of the view and the susceptibility of the visual receptors to the change that the proposed Development would have on the view.

#### 6.4.2.1 Value of the View

63. The value of a view or series of views is a reflection of the recognition and the importance attached either formally through identification on mapping or being subject to planning designations, or informally through the value which society attaches to the view(s). The value of a view is classified as high, medium-high, medium, medium-low or low and the basis for this assessment is made clear using evidence and professional judgement, based on the following criteria:

- **Formal recognition:** The value of views can be formally recognised through their identification on OS or tourist maps as formal viewpoints, sign-posted and with facilities provided to add to the enjoyment of the viewpoint such as parking, seating and interpretation boards. Specific views may be afforded protection in local planning policy and recognised as valued views. Specific views can also be cited as being of importance in relation to landscape or heritage planning designations, for example the value of a view would be increased if it presents an important vista from a designed landscape or lies within or overlooks a designated area such as a National Scenic Area, which implies a greater value to the visible landscape.
- **Informal recognition:** Views that are well-known at a local level can have an increased value, even if there is no formal recognition or designation. Views or viewpoints are sometimes informally recognised through references in art or literature and this can also add to their value. A viewpoint that is visited or used by a large number of people would tend to have greater importance than one gained by very few people, although this is not always the case.

#### 6.4.2.2 Susceptibility to Change

64. Susceptibility relates to the nature of the viewer experiencing the view and how susceptible they are to the potential effects of the proposed Development. A judgement to determine the level of susceptibility therefore relates to the nature of the viewer and their experience from that particular viewpoint or series of viewpoints, as follows:

- **Nature of the viewer:** The nature of the viewer is described by the occupation or activity which they are engaged in at the viewpoint or series of viewpoints. The most common groups of viewers considered in the visual assessment include residents, road-users, workers and walkers. Viewers whose attention is focused on the landscape, walkers, for example are likely to have a higher sensitivity, as would residents of properties that gain constant views of the proposed Development. Viewers travelling in cars or on trains would tend to have a lower sensitivity as their view is transient and moving. The least sensitive viewers are usually people at their place of work as they are less sensitive to changes in the view; however, this also depends on the nature of their work and the work place which they occupy.
- **Experience of the viewer:** The experience of the visual receptor relates to the extent to which the viewer's attention or interest may be focused on the view and the visual amenity they experience at a particular location. The susceptibility of the viewer to change arising from the proposed Development may be influenced by the viewer's attention or interest in the view, which may be focused in a particular direction, from a static or transitory position, over a long or short duration, and



with high or low clarity. For example, if the principal outlook from a route is aligned directly towards the proposed Development, the experience of the visual receptor would be altered more notably than if the experience related to a glimpsed view seen at an oblique angle from a car travelling at high speed. The visual amenity experienced by the viewer varies depending on the presence and relationship of visible elements, features or patterns experienced in the view and the degree to which the landscape in the view may accommodate the influence of the proposed Development.

**6.4.2.3 Sensitivity Rating**

65. An overall level of sensitivity is applied for each visual receptor or view: high, medium-high, medium, medium-low, low; by combining individual assessments of the value of the receptor and its susceptibility to change. Each visual receptor, meaning the particular person or group of people likely to be affected at a specific viewpoint, is assessed in terms of their sensitivity. The basis for the assessments is made clear using evidence and professional judgement in the evaluation of each receptor. Criteria that tend towards higher or lower sensitivity are set out in **Table 6-4**.

Table 6.4-4 Sensitivity to Change – Visual Receptors

Criteria tending towards higher or lower sensitivity		
	High → Medium → Low	
<b>Value</b>	<p>Specific viewpoint identified in OS maps and/or tourist information and signage. Facilities provided at viewpoint to aid the enjoyment of the view. View afforded protection in planning policy. View is within or overlooks a designated landscape, which implies a higher value to the visible landscape. View has informal recognition and well-known at a local level. View or viewpoint is recognised through references in art or literature.</p>	<p>Viewpoint not identified in OS maps or tourist information and signage. No facilities provided at viewpoint to aid enjoyment of the view. View is not afforded protection in planning policy. View is not within, nor does it or overlook, a designated landscape. View has no informal recognition. View or viewpoint is not characteristic through references in art or literature.</p>
<b>Susceptibility to Change</b>	<p>Viewer whom is likely or liable to be influenced by the proposed Development. Viewers such as walkers, or tourists, whose main attention and interest is on their surroundings. Residents that gain static, long-term views of the proposed Development in their principal outlook. Viewpoint is visited or used by a large number of people. A view that is focused in a specific directional vista, with notable features of interest in a particular part of the view. A view of an undeveloped landscape with little or no built development and/or human influence. Existing elements, features or patterns in view that would contrast with the proposed Development.</p>	<p>Viewer whom is unlikely or not liable to be influenced by the proposed Development. Viewers whose main attention is not focused on their surroundings, such as people at work, or specific forms of recreation. Viewers whom are transient and dynamic, such as those travelling in cars or on trains, where the view is of short duration. View is visited or gained by very few people. Open views with no specific point of interest. A view of a developed, industrial landscape where built elements and structures are present. Existing elements, features or patterns in view that may assist with integration of the proposed Development.</p>
<b>Sensitivity to Change</b>	High → Medium → Low	

**6.4.3 Magnitude of Change on Views**

66. The magnitude of change on views is an expression of the scale of the change that would result from the proposed Development and is dependent on a number of variables regarding the size or scale of the change. A separate assessment is also made of the geographical extent of the area over which this would occur and the duration and reversibility of such changes.

**6.4.3.1 Size or Scale**

67. An assessment is made about the size or scale of change in the view that is likely to be experienced as a result of the proposed Development, based on the following criteria:

- The distance between the visual receptor or viewpoint and the Development. Generally, the greater the distance, the lower the magnitude of change, as the Development would constitute a smaller scale component of the view;
- The amount and size of the Development that would be seen. Visibility may range from one blade tip to all of the turbines. Generally, the larger the Development appears in the view, and the more of the Development that can be seen, the higher the magnitude of change;
- 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. The Development may appear in a similar part of the view to that which includes an operational windfarm or it may appear close to or as an extension to an existing windfarm and its scale of change is assessed in the context of these existing views;
- The field of view available and the proportion of the view that is affected by the Development. Generally, the more of a view that is affected, the higher the magnitude of change would be. If the Development extends across the whole of the open part of the outlook, the magnitude of change would generally be higher as the full view would be affected; Conversely, if the Development covers just a part of an open, expansive and wide view, the magnitude of change is likely to be reduced as the Development would not affect the whole open part of the outlook;
- The scale and character of the context within which the Development would be seen and the degree of contrast or integration of any new features with existing landscape elements, in terms of scale, form, mass, line, height, colour and motion. Contrasts and changes may arise particularly as a result of the more notable rotation movement of the Wind Turbine blades, as a characteristic that gives rise to effects of the Development;
- The consistency of image of the Development in relation to other developments. The magnitude of change of the Development is likely to be lower if its Wind Turbine height, arrangement and layout design are broadly similar to other windfarm developments in the views, as they are more likely to appear as relatively simple and logical components of the landscape;
- The uniformity of appearance of the Development in different views. If the Development appears relatively uniform and consistent in appearance from different viewpoints and viewing angles, in a similar setting and familiar form, this tends to reduce the magnitude of change. If, on the other hand, it appears inconsistent in image, scale and appearance, or from a variety of different angles, and is seen in a different form and setting, the magnitude of change is likely to be higher as it would be a variable and less familiar component of views;
- The extent of the wind energy developed skyline. If the Development would add notably to the wind energy developed skyline in a view, extending the lateral spread of development or increasing the perceived connection between other windfarms, the magnitude of change would tend to be higher;
- The number and scale of developments seen simultaneously or sequentially. Generally, the greater the number of clearly separate developments that are visible, the higher the magnitude of change would be, whereas an extension to an existing windfarm would tend to result in a lower magnitude of change than a separate, new windfarm; and
- The scale and form comparison between developments. If the Development is of a similar scale and form to other visible developments, particularly those seen in closest proximity to it, the magnitude of change would generally be lower as it would have more integration with the other sites and would be less apparent as an addition.

**6.4.3.2 Geographical Extent**

68. The geographic area over which the visual effects would be experienced is also assessed, which is distinct from the size or scale of effect. The extent of the effects would vary depending on the specific nature of the proposed Development and is principally assessed through analysis of the extent of visibility of the proposed Development from visual receptors, to assess the geographical extent of the receptor that would be affected, based on the following criteria:

69. The extent of the visual receptor (a road, footpath or settlement for example) that would experience changes through visibility of the proposed Development. If the proposed Development is visible from extensive areas, the overall change is likely to be higher than if it is visible from a limited part of a receptor. The extent to which the change would affect views, whether this is unique to a particular viewpoint or if similar visual changes occur over a wider area represented by the viewpoint.

**6.4.3.3 Magnitude of Change Rating**

70. An overall assessment of the magnitude of change resulting from the proposed Development on each visual receptor is made by combining the assessment of size or scale and geographical extent. The basis of the assessment is made clear using evidence and professional judgement. The levels of magnitude of change that can occur on views are defined as follows:

- **High**, the proposed Development would result in a major alteration to the baseline view, providing the prevailing influence and/or introducing elements that are substantially uncharacteristic in the receiving view;
- **Medium**, the proposed Development would result in a moderate alteration to the baseline view, providing a readily apparent influence and/or introducing elements potentially uncharacteristic in the receiving view;
- **Low**, the proposed Development would result in a minor alteration to the baseline view, providing a slightly apparent influence and/or introducing elements that are characteristic in the receiving view;
- **Negligible**, the proposed Development would result in a negligible alteration to the baseline view, providing a barely discernible influence and/or introducing elements that are substantially characteristic in the receiving view; and
- **None**, the proposed Development would in no change to the baseline characteristics of the view.

71. There may also be intermediate levels of magnitude of change, such as medium-high or medium-low, where the change falls between the definitions. Criteria that tend towards higher or lower magnitude of change are set out in **Table 6-5**.

Table 6.4-5 Magnitude to Change Criteria – Visual Receptors

Criteria tending towards higher or lower magnitude				
	High	Medium	Low	Negligible
<b>Size or scale of change</b>	Large scale change in the view resulting from loss and/or addition of features and changes in its composition. Proposed Development located in close proximity to the viewpoint and would form large scale component of the view. All or majority of the proposed Development would be visible in the view e.g. full towers and rotor sweep. Proposed Development effects large proportion of available field of view. Proposed Development has high degree of contrast/low degree of integration with existing landscape elements, in terms of scale, form, mass, line, height, colour and texture. Proposed Development appears inconsistently, in a different setting and/or form each time it is visible. Proposed Development contrasts with other existing windfarms in pattern, scale and relationship to key characteristics, creating a confusing or inconsistent image or relationship to key characteristics.	Small scale change in the view resulting from loss and/or addition of features and changes in its composition. Proposed Development located at long distance from the viewpoint and would form small scale component of the view. Limited amount of the proposed Development would be visible in the view e.g. extremity of blade tips. Proposed Development effects small proportion of available field of view. Proposed Development has low degree of contrast/high degree of integration with existing landscape elements, in terms of scale, form, mass, line, height, colour and texture. Proposed Development appears consistent, in a similar setting and/or form each time it is visible. Proposed Development consolidates existing windfarms, relates consistently to a key characteristic of the landscape and/or has a high level of integration forming a unified and cohesive feature in the landscape.		
<b>Geographical Extent</b>	Extensive / long distance	Scattered / mid-range	Limited / short distance	
	Proposed Development is visible over long distances. Proposed Development is visible from widespread areas/extensive parts of visual receptor.	Proposed Development is visible only at short range. Proposed Development is visible from restricted areas/limited parts of visual receptor.		

	Visibility/views of proposed Development occur over a wider area represented by multiple viewpoints.	Visibility/view of proposed Development is unique to a particular location or viewpoint.		
<b>Magnitude of Change</b>	High	Medium	Low	Negligible

**6.4.4 Significance of Effects on Views**

72. The significance of the effect on each view is dependent on all of the factors considered in the sensitivity of the view and the magnitude of change resulting from the proposed Development. These judgements on sensitivity and magnitude are combined to arrive at an overall assessment as to whether the proposed Development would have an effect that is significant or not significant on the visual receptor.

73. **Table 6.2-1** helps to inform the threshold of significance when combining sensitivity and magnitude to assess the significance of effect.

74. A significant effect would occur where the combination of the variables results in the proposed Development having a defining effect on the view or where changes of a lower magnitude occur on a view or visual receptor that is of particularly high sensitivity. A not significant effect would occur where the appearance of the proposed Development is not definitive, and the view continues to be defined principally by its baseline characteristics or where the small scale of change experienced by a high sensitivity receptor is such as to be considered not significant. Irreversible, long-term effects on people who are particularly sensitive to changes in views and visual amenity are more likely to be significant, as are effects on people at recognised viewpoints. Large-scale changes which introduce new, non-characteristic or discordant elements into the view are also more likely to be significant than small changes or changes involving features already present within the view.

75. OPEN has chosen to keep these the consideration of the size or scale of the effect, its geographical extent and its duration and reversibility separate, by basing the magnitude of change on size or scale to determine where significant and not significant effects occur, and then describing the geographical extents of these effects and their duration and reversibility separately. Duration and reversibility are therefore stated separately in relation to the assessed effects (i.e. as short/medium/long-term and temporary/permanent) and are considered as part of drawing conclusions about significance, combining with other judgements on sensitivity and magnitude, to allow a final judgement to be made on whether each effect is significant or not significant.

76. The assessment of visual effects assumes clear weather and optimum viewing conditions. This means that effects that are assessed to be significant may be not significant under different, less clear conditions. Viewing conditions and visibility tend to vary considerably and therefore the likelihood of effects resulting from the proposed Development would vary greatly dependent according to the prevailing viewing conditions.

**6.5 Nature of Effects**

77. The nature of effects refers to whether the landscape and/or visual effect of the proposed Development is positive or negative (herein referred to as 'beneficial' and 'adverse').

78. Guidance provided by the Landscape Institute on the nature of effect in GLVIA3 states that "in the LVIA, thought must be given to whether the likely significant landscape and visual effects are judged to be positive (beneficial) or negative (adverse) in their consequences for landscape or for views and visual amenity", but it does not provide guidance as to how that may be established in practice. The nature of effect is therefore one that requires interpretation and, where applied, this involves reasoned professional opinion.

79. In relation to many forms of development, the LVIA will identify 'beneficial' and 'adverse' effects by assessing these under the term 'Nature of Effect'. The landscape and visual effects of windfarms are difficult to categorise in either of these brackets as, unlike other disciplines, there are no definitive criteria by which the effects of windfarms can be measured as being categorically 'beneficial' or 'adverse'. In some disciplines, such as noise or ecology, it is

possible to quantify the effect of a windfarm in numeric terms, by objectively identifying or quantifying the proportion of a receptor that is affected by the proposed Development and assessing the nature of that effect in justifiable terms. However, this is not the case in relation to landscape and visual effects where the approach combines quantitative and qualitative assessment.

80. Generally, in the development of 'new' windfarms, a precautionary approach is adopted by OPEN, which assumes that significant landscape and visual effects will be weighed on the adverse side of the planning balance. Unless it is stated otherwise, the effects considered in this assessment are considered to be adverse. Beneficial or neutral effects may, however, arise in certain situations and are stated in the assessment where relevant, based on the following definitions:
- **Beneficial effects** contribute to the landscape and visual resource through the enhancement of desirable characteristics or the introduction of new, beneficial attributes. The proposed Development contributes to the landscape by virtue of good design, even if it contrasts with the existing character. The removal of undesirable existing elements or characteristics can also be beneficial, as can their replacement with more appropriate components;
  - **Neutral effects** occur where the proposed Development fits with the existing landscape character or visual amenity. The proposed Development neither contributes to nor detracts from the landscape and visual resource and can be accommodated with neither beneficial or adverse effects, or where the effects are so limited that the change is hardly noticeable. A change to the landscape and visual resource is not considered to be adverse simply because it constitutes an alteration to the existing situation; and
  - **Adverse effects** are those that detract from the landscape character or quality of visual attributes experienced, through the introduction of elements that contrast, in a detrimental way, with the existing characteristics of the landscape and visual resource, or through the removal of elements that are key in its characterisation.

## 6.6 Duration and Reversibility

81. The EIA Regulations (2017) require a description of the likely significant effects on factors including (among other things) 'short-term, medium-term and long-term, permanent and temporary effects'.
82. Duration (short, medium or long-term) and reversibility (permanent or temporary) are separate but linked considerations. Duration of effects are judged on a scale as long-term, medium-term and short-term effects, defined in this methodology as follows:
- **Long-term** – more than 10 years;
  - **Medium-term** – 5 to 10 years.
  - **Short-term** – 1 to 4 years.
83. Reversibility is a judgement about the degree of permanence or temporary nature of an effect, determined by the prospects and the practicality of the particular effect being reversed and the time period over which this may occur. Some forms of development can be considered permanent, while others can be considered temporary or reversible since they have a limited operational life and would be removed and/or the land reinstated.
84. The effect of the proposed Development is considered to be fundamentally reversible, in that the wind turbines and infrastructure can be removed and their effects largely reversed at the end of the operational period, however, there is no proposal to limit the lifetime of the proposed Development, therefore the assessment considers the operational effects of the proposed Development without time limitation and to be operational in perpetuity. The effect of the operation of the proposed Development is therefore assessed as permanent and long-term in this LVIA.
85. The effect of the construction of the proposed Development is assessed as temporary and short-term in this LVIA. Other infrastructure and operations such as the construction processes and plant (including tall cranes and heavy machinery for turbine erection) and construction and storage compounds would be apparent only during the initial construction period of the proposed Development and are assessed as short-term and reversible effects. Borrow pit excavation would also be short-term as borrow pits would be restored at the end of the construction process, although a permanently altered ground profile may remain evident.

86. GLVIA3 sets out an approach to the assessment of magnitude of change in which three separate considerations are combined within the magnitude of change rating. These are the size or scale of the effect, its geographical extent and its duration and reversibility. OPEN considers that the process of combining all three considerations in one magnitude of change rating can distort the aim of identifying significant effects of windfarm development. For example, an increased magnitude of change, based on size or scale, may be reduced to a lower rating if it occurred over a localised geographic extent and for a short duration. This might mean that a potentially significant effect would be overlooked if effects are diluted down due to their geographical extents and/or duration or reversibility.
87. OPEN has chosen to keep these the consideration of the size or scale of the effect, its geographical extent and its duration and reversibility separate, by basing the magnitude of change on size or scale to determine where significant and not significant effects occur, and then describing the geographical extents of these effects and their duration and reversibility separately. Duration and reversibility are therefore stated separately in relation to the assessed effects (i.e. as short/medium/long-term and temporary/permanent) and are considered as part of drawing conclusions about significance, combining with other judgements on sensitivity and magnitude, to allow a final judgement to be made on whether each effect is significant or not significant.
88. Should decommissioning of any of the proposed Development be required e.g. failure of a wind turbine beyond economic repair, it is considered that any effects would be less than those resulting from construction of the proposed Development, and as such this potential for decommissioning has been scoped out of further assessment.

## 6.7 Assessment of Cumulative Landscape and Visual Effects

### 6.7.1 Introduction

89. Assessment of cumulative effects is required by the European EIA Directive and by the associated Regulations. Cumulative effects have been defined in a broad generic sense as "impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project" (Hyder, 1999, p7).
90. In GLVIA3 (Landscape Institute and IEMA, 2013, p120) the guidelines define cumulative landscape and visual effects as those that "result from additional changes to the landscape and visual amenity caused by the proposed Development in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future."
91. SNH's guidance, 'Assessing the Cumulative Impact of Onshore Wind Energy Developments' (SNH, 2012) is widely used across the UK to inform the specific assessment of the cumulative effects of windfarms. This guidance provides the basis for the methodology for the cumulative assessment.
92. The guidance defines the following types of cumulative effects:
- cumulative landscape effects are those effects that 'can impact on either the physical fabric or character of the landscape, or any special values attached to it' (SNH, 2012, p10); and
  - cumulative visual effects are those effects that can be caused by combined visibility, which 'occurs where the observer is able to see two or more developments from one viewpoint' and/or sequential effects which 'occur when the observer has to move to another viewpoint to see different developments' (SNH, 2012, p11).
93. The degree to which cumulative effects occur, or may occur, as a result of more than one windfarm/development proposed Development being constructed/becoming operational are a result of:
- the distance between individual windfarms/relevant developments;
  - the interrelationship between their ZTVs;
  - the overall character of the landscape and its sensitivity to windfarms/other relevant development;
  - the siting, scale and design of the windfarms/developments themselves; and

- the way in which the landscape is experienced.

### 6.7.2 Scope of the Cumulative Assessment

94. The purpose of the cumulative assessment "is to describe, visually represent and assess the ways in which a proposed Development would have additional impacts when considered in addition to other existing, under construction, consented or proposed Developments. It should identify the significant cumulative effects arising from the proposed windfarm." (SNH, 2012, p12).
95. In accordance with the aforementioned guidance, the cumulative assessment focuses on the addition of the proposed Development to other windfarm development. Wind energy development data was sourced directly from relevant local authorities, a range of wind energy developer web sites and local authority online planning application portals. The cumulative assessment includes all wind turbine developments that are operational, under construction, consented or at planning application stage and are over 50 m to tip in height. It is considered that turbines below 50m in height are unlikely to result in significant cumulative effects with the proposed Development.
96. A cumulative search area base plan was produced (45 km) (Figure 6.12a). The extent of detailed cumulative assessment within this area is then defined relative to key landscape and visual receptors and anticipated effects, focussing on potential significant cumulative effects, and refining to a list of projects to those within 'influencing distance'.
97. Based on surrounding topography and the locations of wind farm developments within this 45 km radius search area it is considered that there is no likelihood of significant cumulative effects between the proposed Development and any of the cumulative sites that lie beyond 20km of the Development. For this reason, the detailed assessment within the LVIA has focussed on the cumulative sites within 20km of the proposed Development. Cumulative ZTVs have been produced for existing and under construction windfarms plus consented and undetermined windfarm applications within 20km. Where operational windfarms are in close proximity to each other they have been grouped for ZTV production to help illustrate the theoretical visibility of the existing baseline.
98. Cumulative wirelines are prepared for all relevant viewpoints, with all developments within the 45 km search area shown in the wirelines to illustrate the proposed Development in the wider context of other wind energy developments and support the approach to cumulative assessment.
99. This detailed assessment area for the cumulative assessment in line with guidance (SNH, 2012, p15) "At every stage in the process the focus should be on the key cumulative effects which are likely to influence decision making, rather than an assessment of every potential cumulative effect". The cumulative assessment focuses on identifying cumulative effects which are likely to be a key consideration in determining the application, rather than an assessment of every potential cumulative effect.
100. The cumulative situation changes frequently as applications are made or withdrawn, and the layouts of submitted application windfarms are changed. It is therefore necessary to decide and agree on a cut-off date when the sites and layouts to be included are fixed. The cumulative assessment includes operational, consented and application stage wind energy developments as of September 2019. Any changes in the cumulative situation after this date are not incorporated in the assessment.
101. In terms of the timescale of proposals for inclusion both SNH guidance and GLVIA3 advise in their guidance that the assessment of the cumulative impacts associated with the proposed Development should encompass the effects of the proposal in combination with existing, under construction, consented and application stage windfarms awaiting determination. Schemes that are at the pre-planning or scoping stage are not generally considered in the assessment of cumulative effects because firm information on which to base the assessment is not available. There may be specific occasions where the inclusion of such scoping stage schemes is considered to be necessary by the statutory consultees, however this has not been considered necessary in this LVIA.
- ### 6.7.3 Cumulative Development Scenarios
102. GLVIA3 (Landscape Institute and IEMA, 2013, p120) advises in relation to the baseline, taking 'the proposed Development' to mean the main proposal that is being assessed, "it is considered that existing schemes and those which are under construction should be included in the baseline for both landscape and visual effects assessments (the LVIA baseline). The baseline for assessing cumulative landscape and visual effects should then include those schemes considered in the LVIA and in addition potential schemes that are not yet present in the landscape but are at various stages in the development and consenting process". The LVIA follows this approach and the cumulative effects that would potentially arise from the addition of the proposed Development into a context that includes existing or under construction windfarms are assessed within the effects considered against the landscape and visual baseline.
103. The likely significant cumulative effects of the proposed Development are assessed in relation to two further relevant scenarios within the cumulative assessment:
- **The consented scenario:** the cumulative assessment assesses the effect of the proposed Development in addition to windfarms already present in the landscape (operational/under construction windfarms) and windfarms that are likely to soon be present (consented windfarms) ('the consented scenario'). This scenario assumes that all consented wind energy developments have become operational and are part of a theoretical baseline situation. The cumulative assessment in the consented scenario identifies the magnitude of change that would arise due to the contribution of the proposed Development, when considered with operational, under construction and consented wind energy developments in the landscape. The effects identified are considered as having some likelihood to arise, on the assumption that consented windfarms will be built and become operational, however it is often the case that consented windfarms are not ultimately built, which reduces the likelihood of consented scenario effects arising.
  - **The application stage scenario:** a further hypothetical scenario is also assessed, that not only takes into the account the operational, under construction and consented windfarms, but also those that have valid (but as yet undetermined) planning applications ('the application stage scenario'). The application stage scenario assumes that all application stage wind energy developments have become operational and are part of a theoretical baseline situation. The cumulative assessment in the application stage scenario identifies the magnitude of additional cumulative change that would arise due to the contribution of the proposed Development, when considered with operational, consented and application stage wind energy developments in the landscape. The effects identified are considered as being less likely to arise, as it is unlikely that all application stage windfarms will gain consent.
104. Pre-application stage windfarms are identified as part of the cumulative search but are not assessed in any detail due to the difficulty in gathering information, the likelihood of scoping stage layouts being changed during the EIA process or pre-application schemes not ultimately being submitted as planning applications.
- ### 6.7.4 Types of Cumulative Effect
105. The aim of the cumulative assessment is to identify the additional changes which would be brought about by the proposed Development when considered in conjunction with other windfarms. In accordance with guidance (SNH, 2012), the LVIA for each receptor considered assesses the effect arising from the addition of the proposed Development to the cumulative situation, and not the overall effect of multiple windfarms. Adjacent developments may complement one another, or may be discordant with one another, and it is the increased or reduced level of significance of effects which arises as a result of this change that is assessed in the cumulative assessment.
106. However, in considering the detailed cumulative effects described within the LVIA, a broad statement relating to the combined cumulative effect of multiple windfarms in the area has also been provided in the LVIA summary, see section 6.9 in the main LVIA chapter.
- #### 6.7.4.1 Cumulative Landscape Effects
107. The cumulative development of windfarms within a particular area may build up to create different types of landscape. Significant cumulative landscape effects may arise where a 'Landscape with windfarms' is created, as a result of the addition of the proposed Development to other existing or proposed windfarms, which results in wind turbines becoming sufficiently prolific that they become a prevailing or key landscape and visual characteristic.
108. The significance of the cumulative landscape effect from the addition of the proposed Development reflects the intensification of windfarms within the landscape, which is assessed as follows:

- The proposed Development forms a separate isolated feature from other windfarms within the landscape, too infrequent and of insufficient influence to be perceived as a characteristic of the area. The cumulative landscape effect of the Proposed Development is unlikely to be significant;
- The addition of the proposed Development results in windfarms forming a key characteristic of the landscape, exerting sufficient presence as to establish or increase the extent of a 'landscape with windfarms', but not of sufficient dominance to be a defining characteristic of the area. The cumulative landscape effect of the proposed Development may be significant or not significant, depending on the sensitivity of the receptor, magnitude of the change and specific effects arising from the proposed Development; and
- The addition of the proposed Development results in windfarms forming the prevailing characteristic of the landscape, seeming to define the landscape as a 'windfarm landscape' character type. The cumulative landscape effect of the proposed Development is likely to be significant.

109. These effects can occur at varying scales, for example, effecting a local character type, or at a regional level, which is assessed as part of the geographic extent assessment in the LVIA.

#### 6.7.4.2 Cumulative Visual Effects

110. Cumulative visual effects consist of combined and sequential effects:

- combined visibility occurs where the observer is able to see two or more developments from one viewpoint. Combined visibility may either be 'in combination', where several windfarms are within the observer's main angle of view at the same time, or 'in succession', where the observer has to turn to see the various windfarms. The cumulative visual effect of the proposed Development may be significant or not significant depending on factors influencing the cumulative magnitude of change, such as the degree of integration and consistency of image with other windfarms in combined views; and the position of the development relative to other windfarms and the landscape context in successive views.
- sequential visibility occurs when the observer has to move to another viewpoint to see different developments. Sequential effects are assessed along regularly used routes such as major roads, railway lines and footpaths. The occurrence of sequential effects range from 'frequently sequential' (the features appear regularly and with short time lapses between, depending on speed of travel and distance between the viewpoints) to 'occasionally sequential' (long time lapses between appearances, because the observer is moving slowly and/or there are large distances between the viewpoints). The cumulative visual effect of the proposed Development is more likely to be significant when frequently sequential.

111. The methodology for the assessment of cumulative landscape and visual effects involves the undertaking of a baseline study of the existing and potential future windfarm/other relevant development influence, an evaluation of sensitivity, magnitude of change and the resulting significance of cumulative effects.

#### 6.7.5 Cumulative Sensitivity of Landscape and Visual Receptors

112. In evaluating cumulative sensitivity, the value component of the assessments of sensitivity would not change, however, in an evolving windfarm/other relevant development context the susceptibility of a landscape and visual receptor to the introduction of the proposed Development may increase or decrease. This is therefore re-evaluated based on the criteria contained in the landscape and visual susceptibility criteria sections of this methodology.

#### 6.7.6 Cumulative Magnitude of Change

113. The cumulative magnitude of change is an expression of the degree to which landscape character receptors and visual receptors/views would be changed by the addition of the proposed Development to windfarms/other relevant developments that are already operational, consented or at application stage. Where required scoping stage windfarms and other early stage developments may exceptionally be included. The cumulative magnitude of change is assessed according to a number of criteria, described as follows.

- **The location of the proposed Development in relation to other windfarm developments.** If the proposed Development is seen in a part of the view or setting to a landscape receptor that is not affected by other development, this would generally increase the cumulative magnitude of change as it would extend influence into an area that is currently unaffected by development. Conversely, if the proposed Development is seen in the context of other sites, the cumulative magnitude of change may be lower as development is not being extended to otherwise undeveloped parts of the outlook or setting. This is particularly true where the scale and layout of the proposed Development is similar to that of the other

sites as where there is a high level of integration and cohesion with an existing site the various developments may appear as a single site;

- **The extent of the developed skyline.** If the proposed Development would add notably to the developed skyline in a view, the cumulative magnitude of change would tend to be higher as skyline development can have a particular influence on both views and landscape receptors;
- **The number and scale of developments seen simultaneously or sequentially.** Generally, the greater the number of clearly separate developments that are visible, the higher the cumulative magnitude of change would be. The addition of the proposed Development to a view or landscape where a number of smaller developments are apparent would usually have a higher cumulative magnitude of change than one or two large developments as this can lead to the impression of a less co-ordinated or strategic approach;
- **The scale comparison between developments.** If the proposed Development is of a similar scale to other visible developments, particularly those seen in closest proximity to it, the cumulative magnitude of change would generally be lower as it would have more integration with the other sites and would be less apparent as an addition to the cumulative situation;
- **The consistency of image of the proposed Development in relation to other developments.** The cumulative magnitude of change of the proposed Development is likely to be lower if its turbine height, arrangement and layout design are broadly similar to other developments in the landscape, as they are more likely to appear as relatively simple and logical components of the landscape;
- **The context in which the developments are seen.** If developments are seen in a similar landscape context, the cumulative magnitude of change is likely to be lower due to visual integration and cohesion between the sites. If developments are seen in a variety of different landscape settings, this can lead to a perception that windfarm development is unplanned and uncoordinated, affecting a wide range of landscape characters and blurring the distinction between them; and
- **The magnitude of change of the proposed Development as assessed in the main assessment.** The lower this is assessed to be, the lower the cumulative magnitude of change is likely to be. Where the proposed Development itself is assessed to have a negligible magnitude of change on a view or receptor there would not be a cumulative effect as the contribution of the proposed Development would equate to the 'no change' situation.

114. Definitions of cumulative magnitude of change are applied in order that the process of assessment is made clear. These are:

- **High**, where the addition of the proposed Development to the landscape or view would result in a major incremental change, loss or addition to the cumulative windfarm/development situation;
- **Medium**, where the addition of the proposed Development would result in a moderate incremental change, loss or addition to the cumulative windfarm/development situation;
- **Low**, where the addition of the proposed Development would result in a minor incremental change, loss or addition to the cumulative situation;
- **Negligible**, where the addition of the proposed Development to other wind energy developments in the landscape or view would result in a negligible incremental change, loss or addition to the cumulative situation; and
- **None**, where the addition of the proposed Development to other wind energy developments in the landscape or view would have no change to the cumulative windfarm situation and its addition equates to a 'no change' situation.

115. There may also be intermediate levels of cumulative magnitude of change: medium-high and medium-low; where the change falls between two of the definitions.

#### 6.7.7 Significance of Cumulative Effects

116. The objective of the cumulative assessment is to determine whether any effects that the proposed Development would have on landscape receptors and visual receptors, when seen or perceived in combination with other existing and proposed sites, would be significant or not significant. Significant cumulative landscape and visual effects arise where the addition of the proposed wind turbines or other similar/large scale development to a specific baseline, leads to windfarms becoming a prevailing landscape and visual characteristic of a receptor that is sensitive to such change. Cumulative effects may evolve as follows:

- a small scale, single windfarm would often be perceived as a new or 'one-off' landscape feature or landmark within the landscape. Except at a local site level, it usually cannot change the overall existing landscape character, or become a new characteristic element of a landscape;

- with the addition of further windfarm development, windfarms can become a characteristic element of the landscape, as they appear as landscape elements or components that are repeated. Providing there was sufficient 'space' or undeveloped landscape/skyline between each windfarm, or the overlapping of several windfarms was not too dense; the proposed Developments or other similar/large scale developments would appear as a series of developments within the landscape and would not necessarily become the dominant or defining characteristic of the landscape nor have significant cumulative effects; and
  - the next stage would be to consider larger commercial windfarms/developments and/or an increase in the number of windfarms/developments within an area that either overlap or coalesce and/or 'join-up' along the skyline. The effect is to create a landscape where the windfarm element is a prevailing characteristic of the landscape. The result would be to materially change the existing landscape character of a landscape type, or the landscape in a view and resulting in a significant cumulative effect. A landscape characterised by windfarm development may already exist as part of the baseline landscape context.
117. Less extensive, but nevertheless significant cumulative landscape and visual effects may also arise as a result of the addition of the proposed Development where it results in a landscape or view becoming defined by the presence of more than one windfarm or similar/large scale development, so that other patterns and components are no longer definitive, or where the proposed Development contrasts with the scale or design of an existing or proposed Development. Higher levels of significance may arise from cumulative landscape and visual effects related to the proposed Development being in close proximity to other windfarms when they are clearly visible together in views, however provided that the proposed Development is designed to achieve a high level of visual integration, with few notable visual differences between windfarms, these effects may not necessarily be significant. In particular, the effects of a windfarm extension are often less likely to be significant, where the effect is concentrated, providing that the design of the windfarms are compatible and that the overall capacity of the landscape is not exceeded.
118. The capacity of the landscape or view may be assessed as being exceeded where the landscape or visual receptor becomes defined by windfarm development, or if the proposed Development extends across landscape character types or clear visual/topographic thresholds in a view. More substantial cumulative effects may result from windfarms that have some geographical separation, but remain highly inter-visible, potentially resulting in extending effects into new areas, such as an increased presence of windfarm development on a skyline, or the creation of multiple, separate windfarm defined landscapes.
119. In accordance with guidance (SNH, 2012), the LVIA for each receptor considered assesses the effect arising from the addition of the proposed Development to the cumulative situation, and not the overall effect of multiple windfarms. However, in considering the detailed cumulative effects described within the LVIA, a broad statement relating to the combined cumulative effect of multiple windfarms in the area has also been provided in the LVIA summary, see section 6.9 in the main LVIA chapter.

## 6.8 Solar Photovoltaic Arrays

### 6.8.1 Introduction

120. Areas of the Site will be used to locate ground mounted solar photovoltaic arrays (solar PV arrays). Four areas have been identified for solar development with the potential for an installed capacity of around 20 MW. These four solar search areas are labelled A to D on Figure 4.1.
121. A detailed description of the proposed solar array is found within **Chapter 4: Development Description**. The indicative layout consists of an array of solar photovoltaic modules orientated in a southerly direction. The modules will stand approximately 0.5 m Above Ground Level (AGL) at their minimum point and will be angled around 25° to the horizontal and arranged in rows. Depending on the finalised angle of elevation, and the number of rows of modules stacked, the maximum height of the modules will be around 3.0 m AGL.

### 6.8.2 Potential Solar Array effects

122. The Solar Search Areas are assessed in the LVIA, along with the other infrastructure proposed for the Site. The landscape character assessment is limited to the Plateau Moorland with Forest LCT (17a), Glentroot unit in which the proposed Development (including the Solar Array) is located. Key viewpoints for the Solar Array are Viewpoint

01 - Eldrig Fell; Viewpoint 02 - SUW (Knockniehourie); and Viewpoint 03 - SUW (Craig Airie Fell), where elevated views of the Site area are possible. The following assumptions have been made with regards to the landscape and visual effects of the solar array.

123. Typical construction activities with the potential to affect the landscape and visual resource include:
- Erection of photovoltaic panels, power units and fencing; and
  - Vehicular movement on and off-site.
124. Once operational the potential effects to the landscape and visual resource include:
- Loss or fragmentation of open moorland landscape;
  - Effects on the existing landform, landscape character and landscape scale of the Site area;
  - Potential for the proposed Development to introduce activity which is out of keeping with existing land uses or with established cultural or historic landscapes; and
  - Potential visual intrusion in sensitive views or in close proximity to sensitive receptors e.g. SUW.
125. There is potential for reflection of sunlight from the surface of the solar panels in views, however, perceived reflected light from solar PV panels is limited by the sun's position in the sky, the time of year and the time of day, generally occurring within minimal periods in the early morning or evening. Furthermore, the solar panels are designed to have extremely low reflection levels using the latest anti-reflective treatment to ensure that any glare is minimized.
- ### 6.8.3 Use of Parameter Model and Rochdale Envelope
126. The LVIA has used clearly defined development parameters to assess the potential effects on the landscape and visual resource of the Study Area as a result of the Solar Array. Maximum development footprints (Solar Search Areas) have been combined with maximum height parameters (3m) for each compartment within the Site to allow a greater understanding of potential visibility through the creation of ZTV (Zone of Theoretical Visibility) diagrams.
127. The Scottish Government's PAN (Planning Advice Note) 1/2013 Environmental Impact Assessment (updated May 2017), provides justification of the use of the Rochdale Envelope. It states in section 4.4 that –
128. *'by applying the principles of an approach commonly known as the 'Rochdale Envelope' it is possible to undertake an environmental assessment which takes account of the need for flexibility in the future evolution of the detailed project proposal, within clearly defined parameters. In such cases, the level of detail of the proposals must be sufficient to enable a proper assessment of the likely environmental effects, and any resultant mitigation measures - if necessary considering a range of possibilities.'*
129. Based on these parameters, a Solar Array ZTV has been produced for the Solar Search Areas to illustrate the potential visibility of the solar array within the local context of a detailed 5 km area. Beyond this area the ZTV of the Solar Array is very limited and the potential for significant effects are further limited due to distance and large scale forestry that intervenes.
130. In addition to the creation of Solar Array ZTVs, block model visualisations have been produced for the three key viewpoints, using Visual Nature Studio software, to provide an understanding of the maximum parameter model extent in views of the proposed development. These include visible parameter blocks that sit alongside the proposed Development turbines and other infrastructure.

## 6.9 Assessment of Lighting Effects

131. Civil Aviation Authority (CAA) guidance requires that 'en-route obstacles' at or above 150 m above ground level are lit with visible lighting to assist their detection by aircraft. As such, there is potential that parts of the proposed Development may be visible at night. The effect of the proposed Development at night would result from visible lighting located on the nacelles, and on the towers, of all turbines.
132. It should be noted that some turbines would include infra-red lighting on the turbine hubs, which would not be visible to the human eye. Details of the lighting would be agreed with the MoD. The focus of the **Visual Assessment of**

**Turbine Lighting TA6.2** is on the visible lighting requirements of the proposed Development. A description of the proposed turbine lighting is found within **Chapter 4 Development Description** and **Chapter 14, Section 14.2 Aviation**, based on this, the assumptions and parameters for assessment of lighting effects have been made with regards to the LVIA.

133. GLVIA 3 (page 103) provides the following guidance on the assessment of lighting effects: *"For some types of development the visual effects of lighting may be an issue. In these cases it may be important to carry out night-time 'darkness' surveys of the existing conditions in order to assess the potential effects of lighting and these effects need to be taken into account in generating the 3D model of the scheme. Quantitative assessment of illumination levels, and incorporation into models relevant to visual effects assessment, will require input from lighting engineers, but the visual effects assessment will also need to include qualitative assessments of the effects of the predicted light levels on night-time visibility."*
134. A Hub Height ZTV of those turbines with tips heights exceeding 150 m was used to identify where there would be direct line of sight from the surrounding area to those turbines proposed to be lit. The visual effect of the proposed Development at night is presented in **TA: 6.2** and has been informed by night-time photomontage visualisations produced from four viewpoint locations selected from the LVIA viewpoints and agreed with statutory consultees. The four night time visual assessment viewpoints are: Viewpoint 4: SUW (west of Derry); Viewpoint 6: Minor Road Bennylow (Culvennan Fell); Viewpoint 14: Bruce's Stone, Glen Trool; and Viewpoint 15: A77 by Cairnpat.
135. In terms of how lighting is captured in visualisations, the main change in the latest version of the SNH guidance "Visual Representation of Wind Farms" (Version 2.2, February 2017) is in paragraphs 174-177, which states: *"The visualisation should use photographs taken in low light conditions, preferably when other artificial lighting (such as street lights and lights on buildings) are on, to show how the wind farm lighting will look compared to the existing baseline at night"...* *"We have found that approximately 30 minutes after sunset provides a reasonable balance between visibility of the landform and the apparent brightness of artificial lights, as both should be visible in the image."* The night time photography has therefore been captured in low light conditions, when other artificial lighting (such as street lights and lights on buildings) is on, to show how the windfarm lighting would look compared to the existing baseline at night.
136. Existing lights shown in the photographs in **TA 6.2** appear larger and more blurred than those seen to the naked eye in the field when the photographs were captured. The term used in photography to describe this effect is 'Bokeh' which has been defined as 'the way the lens renders out-of-focus points of light'. This has proved difficult to avoid when taking photographs of light at varied distances across a view. The blurred nature of the lights is also exacerbated by their movement, particularly on vehicle headlights. Where the lights of the proposed Development have been added to the night time views this effect has been emulated. The lights that encircle communication masts are also blurred together creating a series of combined but brighter lights when viewed at distance.
137. The turbine blades, when they intermittently pass in front of the aviation lights, would cause randomised flickering when the lights are switched 'on'. The turbines used in the night time visualisations have been positioned so that their blades face away from the viewpoint so that all the lights are visible and on within the visualisations, representing a worst-case impression. The flickering effect caused by the blades interacting with the lights would be most usually apparent from a south westerly direction due to the prevailing south westerly wind.
138. The lighting represented in the viewpoint visualisations has been calibrated using examples of existing, equivalent, turbine lighting observed in the field in other parts of Scotland, during similar periods of dusk / darkness as captured in the photography for the agreed viewpoints. Photographic examples of existing turbine lights are also therefore included in **TA: 6.2** as reference. For the assessment of lighting effects, the visual sensitivity and magnitude criteria described earlier in this **Technical Appendix (TA: 6.1)** has been applied.

## 6.10 Visual Representations

### 6.10.1 Zone of Theoretical Visibility (ZTV)

139. The ZTV has been generated using Geographic Information System (GIS) software (ESRI ArcGIS Version 10.7.1) to demonstrate the number of turbines that may theoretically be seen from any point in the Study Area. The ZTVs, show the number of turbines (blade tips) that are theoretically visible around the Study Area (based on the maximum blade tip heights as described in **Chapter 4**). The Hub Height ZTVs, show the number of turbine hubs theoretically visible in the Study Area (hub heights are derived from the maximum turbine rotor dimension listed for maximum blade tip heights in **Chapter 4**). When used in conjunction with the Blade Tip ZTV, the Hub Height ZTV provides an indication of the degree to which the wind turbines may be visible. Solar Array ZTVs have been created using the parameters described in **Section 6.8** of this Technical Appendix, based on the description in **Chapter 4**.
  140. There are limitations in this theoretical production, and these should be considered in the interpretation and use of the ZTV:
    - the ZTV illustrates the 'bare ground' situation, and does not take into account the screening effects of vegetation, buildings, or other local features that may prevent or reduce visibility;
    - the ZTVs are based on theoretical visibility from 2m above ground level;
    - The Solar Array ZTV is calculated using a grid of 3 m high points evenly spaced across the Solar Array Search areas;
    - the 45 km ZTVs are based on a 50 m data grid (Ordnance Survey (OS) Digital Terrain Model (DTM)) and the 15 km ZTVs are based on 5 m data grid (OS Terrain 5), therefore relatively small changes in elevation may not be accounted for;
    - the Blade Tip ZTV does not indicate the decrease in visibility that occurs with increased distance from the proposed Development. The nature of what is visible from 3 km away would differ markedly from what is visible from 10 km away, although both are indicated on the Blade Tip ZTV as having the same level of visibility; and
    - there is a wide range of variation within the visibility shown on the ZTV, for example, an area shown on the Blade Tip ZTV as having visibility of large numbers of turbines may gain views of the smallest extremity of blade tips, or of many full turbines. This can make a considerable difference in the effects of the proposed Development on that area. The Hub Height ZTV should be used in conjunction with the Blade Tip ZTV to provide an indication of the degree to which the wind turbines are visible.
  141. These limitations mean that while the ZTV is used as a starting point in the assessment, providing an indication of where the proposed Development would theoretically be visible, the information drawn from the ZTV is checked in the field, to ensure that the assessment conclusions represent the visibility of the proposed Development reasonably accurately.
  142. using ArcGIS 10.7.1 Viewshed Tool and the same data as the other ZTVs. The Horizontal Angle ZTV show the horizontal field of view (in degrees) that may be affected by views of the turbines.
- ### 6.10.2 Visualisations
143. The viewpoint assessment is illustrated by a range of visualisations, including photographs and photomontages, which accord with SNH's Visual Representation of Wind Farms Version 2.2 (SNH, 2017). Visualisations of windfarms have a number of limitations when using them to form a judgement on a windfarm proposal. These include:
    - a visualisation can never show exactly what the windfarm would look like in reality due to factors such as: different lighting, weather and seasonal conditions which vary through time and the resolution of the image;
    - the images provided give a reasonable impression of the scale of the turbines and the distance to the turbines, but can never be 100% accurate;
    - a static image cannot convey turbine movement, or flicker or reflection from the sun on the turbine blades as they move;
    - the viewpoints illustrated are representative of views in the area, but cannot represent visibility at all locations;
    - to form the best impression of the impacts of the windfarm proposal these images are best viewed at the viewpoint location shown; and
    - the visualisations must be printed at the correct size to be viewed properly.

144. The photographs used to produce the photomontages have been taken using Canon EOS 5D and 6D Digital SLR cameras, with a fixed lens and a full-frame (35 mm negative size) CMOS sensor. The photographs are taken on a tripod with a pano-head at a height of approximately 1.5 m above ground.
145. To create the baseline panorama, the frames are individually cylindrically projected and then digitally joined to create a fully cylindrically projected panorama using Adobe Photoshop or PTGui software. This process avoids the wide-angle effect that would result should these frames be arranged in a perspective projection, whereby the image is not faceted to allow for the cylindrical nature of the full 360-degree Horizontal Field of View (HFOV) but appears essentially as a flat plane.
146. Tonal alterations are made using Adobe software to create an even range of tones across the photographs once joined.
147. The photographs are also joined to create planar projection panoramas using PTGui software. These are used in the creation of the 53.5 degree field of view photomontages. In some views, more than one 53.5 degree field of view panorama is prepared, in order to accommodate the full width of the proposed Development.
148. Wireline representations that illustrate the proposed Development model set within a computer-generated image of the landform are used in the assessment to predict the theoretical appearance of the turbines. These are produced with Resoft Wind farm software and are based on a terrain model with a 50 m data grid (OS Panorama) with a more detailed area of terrain modelling (OS terrain 5) used for the 15 km ZTVs. There are limitations in the accuracy of DTM data so that landform may not be picked up precisely and may result in turbines being more or less visible than is shown, however, the use of OS terrain 5 minimises these limitations. Where descriptions within the assessment identify the numbers of turbines visible this refers to the illustrations generated and therefore the reality may differ to a degree from these impressions.
149. Photomontages have been produced for the majority of views, again using Resoft Wind farm software, to provide a more realistic image of the appearance of the proposed Development. In most views these include the introduction of the turbines only as these are the elements that create the greatest change in views and are likely to be most visible from the surrounding area. Where there is notable visibility of Site infrastructure and where practical, this is shown in the photomontages and is generated using a combination of 3D software such as Topos, Visual Nature Studio, Sketchup and 3D Studio Max. This includes visible parameter blocks of the Solar Search Areas that sit alongside the proposed Development turbines and other infrastructure.
150. The baseline photographs and cumulative wireline visualisations shown for each viewpoint cover a 90-degree HFOV (or in some cases, up to 360-degree), which accords with SNH guidance. These are cylindrically projected images and should be viewed flat at a comfortable arm's length.
151. The 53.5 degree HFOV wirelines and photomontage are prepared using a planar projected image and should also be viewed flat at a comfortable arm's length. These images are each printed on paper 841 x 297 mm (half A1) which provides for a relatively large scale image.
152. The 53.5 degree photomontage view does not always include a view of key existing windfarms in the view and it is important therefore that the 90 degree baseline panoramas provided are reviewed alongside the 53.5 degree photomontages when reviewing the visualisations so that these existing windfarms are properly taken into account.
153. In the wirelines, the turbines are shown with the central turbines facing the viewer directly, with the full rotor diameter visible at its tallest extent. In the photomontages, the turbine rotors are shown with a random appearance with the central turbines facing the viewer directly. In the night-time photomontages, lights are shown as visible and without obstruction from turbine blades.
154. The photographs and other graphic material such as wirelines and photomontages used in this assessment are for illustrative purposes only and, whilst useful tools in the assessment, are not considered to be completely representative of what would be apparent to the human eye. The assessments are carried out from observations in the field and therefore may include elements that are not visible in the photographs.



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