**Appendix 6.1**

LVIA Methodology, ZTV and Visualisations Production

# Appendix 6.1 LVIA Methodology, ZTV and Visualisations Production

## Assessing Landscape Effects

**A.1** As outlined in GLVIA3 'An assessment of landscape effects deals with the effects of change and development on landscape as a resource.' (GLVIA3, Para 5.1, Page 70). Changes may affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character.

**A.2** An assessment of landscape effects requires consideration of the nature of landscape receptors (sensitivity of receptor) and the nature of the effect on those receptors (magnitude of effect). GLVIA3 states that the nature of landscape receptors should be assessed in terms of the susceptibility of the receptor to the type of change proposed, and the value attached to the receptor. The nature of the effect on each landscape receptor should be assessed in terms of scale of effect, geographical extent, duration and reversibility.

**A.3** These aspects are considered together, to form a judgement regarding the overall significance of landscape effects (GLVIA3, Figure 5.1 Page 71). The following sections set out the methodology used to evaluate sensitivity and magnitude.

### Sensitivity of Landscape Receptors

**A.4** The sensitivity of a landscape receptor to change is defined as **high**, **medium** or **low** and is based on weighing up professional judgements regarding susceptibility and value, as set out below.

### Sensitivity of Landscape Receptors

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

### Susceptibility of Landscape Receptors

**A.5** Susceptibility is defined by GLVIA3 as 'the ability of the landscape receptor (whether it be the overall character or quality/condition of a particular type or area, or an individual element and/or feature, or a particular aesthetic and perceptual aspect) to accommodate the proposed development without undue consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies' (GLVIA3 paragraph 5.40).

**A.6** A series of criteria are used to evaluate the susceptibility of Landscape Character Types (LCTs) to electricity transmission infrastructure as set out in the table below. Aspects of these criteria are drawn from a range of published sources relating to electricity transmission infrastructure, including the Holford Rules and GLVIA3.

**A.7** Where it is judged that significant effects are unlikely to occur, the assessment of potential effects on some receptors may be 'scoped out'. For an Environmental Impact Assessment (EIA) development this is usually agreed at the scoping stage.

### Aspects Influencing Susceptibility of Landscape Receptors to Electricity Transmission Infrastructure

| Criteria | Aspects indicating reduced susceptibility to electricity transmission infrastructure | ←→ | Aspects indicating greater susceptibility to electricity transmission infrastructure |
|---|---|---|---|
| Landscape Scale | Larger scale. | ←→ | Smaller scale. |
| Topography and landform | Undulating and valley landscapes which offer opportunities for screening and back clothing of electricity transmission infrastructure. | ←→ | Presence of strong topographical variety or distinctive landform features.<br>Absence of strong topographical variety, featureless, convex or flat with little opportunity for screening and back clothing of electricity transmission infrastructure. |
| Landcover, pattern and complexity | Extensive areas of wood/forestry cover to reduce views of electricity transmission infrastructure (e.g. providing screening or back clothing of infrastructure).<br>Simple, regular or uniform. | ←→ | Limited woodland/forestry cover to help reduce views of electricity transmission infrastructure (e.g. providing screening or back clothing of infrastructure).<br>Complex, rugged or irregular. |
| Settlement and man-made influence | Presence of contemporary structures e.g. utility infrastructure or industrial elements. | ←→ | Absence of modern development.<br>Presence of small-scale, historic or vernacular settlement. |
| Ridges and Skylines | Non-prominent / screened skylines.<br>Presence of existing modern man-made features (e.g. other electricity transmission infrastructure, telecommunications masts or wind turbines). | ←→ | Distinctive, undeveloped skylines.<br>Skylines that are highly visible over large areas or exert a large influence on landscape character.<br>Skylines with important historic landmarks. |
| Inter-visibility with adjacent landscapes | Little inter-visibility with adjacent sensitive landscapes or viewpoints. | ←→ | Strong inter-visibility with sensitive landscapes.<br>Forms an important part of a view from sensitive viewpoints. |
| Perceptual aspects | Close to visible or audible signs of human activity and development. | ←→ | Remote from visible or audible signs of human activity and development. |

**A.8** Published landscape capacity or sensitivity studies (where they exist) may be reviewed to inform the evaluation of susceptibility, in addition to fieldwork undertaken across the study area. This review includes an evaluation as to the relevance of the publication to the assessment being undertaken (e.g. consideration of the purpose and scope of the published studies and whether they are still deemed to be current/up to date).

### Value of Landscape Receptors

**A.9** The European Landscape Convention advocates that all landscape is of value, whether it is the subject of defined landscape designation or not: 'The landscape is important as a component of the environment and of people's surroundings in both town and country and whether it is ordinary landscape or outstanding landscape.' The value of a landscape receptor is recognised as being a key contributing factor to the sensitivity of landscape receptors.

**A.10** The value of landscape receptors is determined with reference to:

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

**A.11** Internationally and nationally designated landscapes would generally indicate landscape of higher value whereas those without formal designation (such as a widespread or common landscape type without high scenic quality) are likely to be of lower value, bearing in mind that all landscapes are valued at some level. There is however variation across both designated and undesignated areas, and so judgements regarding value are also informed by fieldwork.

**A.12** Landscape value is described as being **high**, **medium** or **low**.

### Magnitude of Landscape Effect

**A.13** The overall judgement of magnitude of landscape effect is based on combining professional judgements on scale, geographical extent, duration and reversibility. Further information on the criteria is provided below.

### Scale of Effect

**A.14** For landscape elements/features this depends on the extent of existing landscape elements that would be lost or changed, the proportion of the total extent that this represents, and the contribution of that element to the character of the landscape.

**A.15** In terms of landscape character, this reflects the degree to which the character of the landscape would change as a result of removal or addition of landscape components, and how the changes would affect key characteristics.

**A.16** The scale of the effect is described as being **large**, **medium**, **small**, or **barely perceptible**.

### Geographical Extent of Effect

**A.17** The geographical extent over which the landscape effect would arise is described as being **large** (scale of the landscape character type, or widespread, affecting several landscape types or character areas), **medium** (more immediate surroundings) or **small** (site level).

### Duration of Effect

**A.18** GLVIA3 states that 'Duration can usually be simply judged on a scale such as short term, medium term or long term.' For the purposes of the assessment, duration is often determined in relation to the phases of the proposed development, as follows:

- Short-term effects are those that occur during construction, and may extend into the early part of the operational phase, e.g. construction activities, generally lasting 0 - 5 years;
- Medium-term effects are those that occur during part of the operational phase, generally lasting 5 - 10 years; and
- Long-term effects are those which occur throughout the operational phase, e.g. presence of electricity transmission infrastructure.

### Reversibility of Effect

**A.19** In accordance with the principles contained within GLVIA3, reversibility is reported as **reversible**, **partially reversible** or **irreversible** (i.e. permanent), and is related to whether the change can be reversed at the end of the phase of development under consideration (i.e. at the end of construction or at the end of the operational lifespan of the development).

**A.20** Judgements on the magnitude of landscape effect (nature of landscape effect) are recorded as **high**, **medium** or **low** and are guided by the table below.

### Magnitude of Landscape Effect

| | Higher | ←→ | Lower |
|---|---|---|---|
| Scale | Extensive loss of landscape features and/or elements, and/or change in, or loss of key landscape characteristics, and/or creation of new key landscape characteristics. | ←→ | Limited loss of landscape features and/or elements, and/or change in or loss of some secondary landscape characteristics. |
| Geographical Extent | Change in landscape features and/or character extending considerably beyond the immediate site and potentially affecting multiple landscape character types/areas. | ←→ | Change in landscape features and/or character extending contained within or local to the immediate site and affecting only a small part of the landscape character type/areas. |
| Duration | Changes experienced for a period of around 10 years or more. | ←→ | Changes experienced for a shorter period of up to 5 years. |
| Reversibility | Change to features, elements or character which cannot be undone or are only partly reversible after a long period. | ←→ | A tempo9rary landscape change which is largely reversible following the completion of construction, or decommissioning of the development. |

### Judging levels of Landscape Effect and Significance

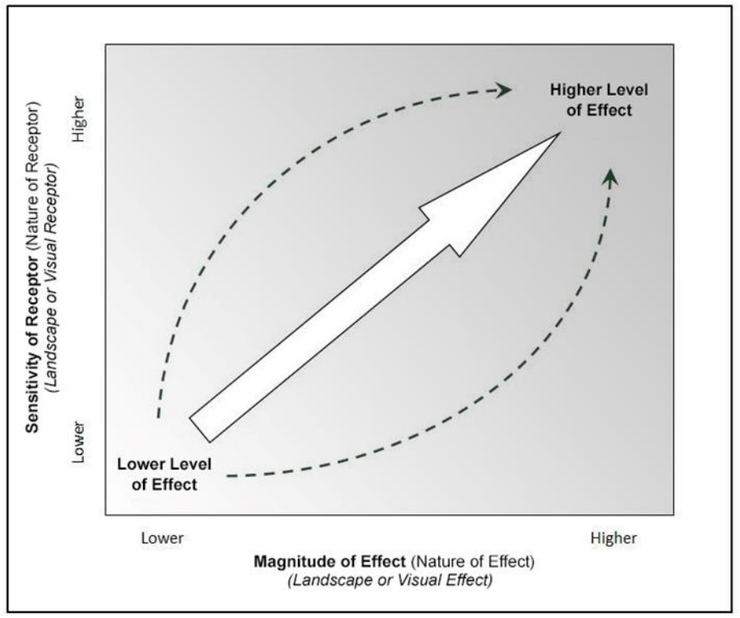
**A.21** The final step in the assessment requires the judgements of sensitivity and magnitude of effect to be combined to make an informed professional assessment on the significance of each landscape effect (GLVIA3, Figure 5.1, Page 71).

**A.22** There may be a complex relationship between the value attached to a landscape and the susceptibility of the landscape to a specific change. Therefore, the rationale for judgements on the sensitivity of landscape receptors needs to be clearly set out for each receptor. It should be noted that whilst landscape designations at an international or national level are likely to be accorded the highest value, it does not necessarily follow that such landscapes all have a high susceptibility to all types of change, and conversely, undesignated landscapes may also have high value and susceptibility to change (GLVIA3, Page 90).

**A.23** Although a numerical or formal weighting system is not applied, consideration of the relative importance of each aspect is made to feed into the overall decision. Levels of effect are identified as **none**, **minor**, **moderate** or **major** where moderate and major effects are considered **significant** in the context of the EIA Regulations.

**A.24** This determination requires the application of professional judgement and experience to take on board the many different variables which need to be considered, and which are given different weight according to site-specific and location-specific considerations in every instance. Judgements are made on a case by case basis, guided by the principles set out in Diagram 6.1 below. A rigid matrix-type approach, which does not take on board professional judgement and experience, and where the level of effect is defined simply based on the level of sensitivity (nature of receptor) combined with the magnitude of change (nature of effect), is not used. As such, the conclusion on the level of effect is not always the same, or determined through a formulaic process.

**Diagram 6.1: Judging levels of effect – Landscape or Visual (including cumulative)**



## Assessing Visual Effects

### Significance of Visual Effects

**A.25** As outlined in GLVIA3 'An assessment of visual effects deals with the effects of change and development on views available to people and their visual amenity' (GLVIA3, Para. 6.1, Page 98). Changes in views may be experienced by people at different locations within the study area including from static locations (normally assessed using representative viewpoints) and whilst moving through the landscape (normally referred to as sequential views, e.g. from roads and walking routes).

**A.26** Visual receptors are individuals or groups of people who may be affected by changes in views and visual amenity. They are usually grouped by their occupation or activity (e.g. residents, motorists, recreational users) and the extent to which their attention is focussed on the view (GLVIA3, Paras. 6.31 - 6.32, Page 113).

**A.27** GLVIA3 states that the sensitivity of visual receptors should be assessed in terms of the susceptibility of the receptor to change in views and/or visual amenity and the value attached to particular views. The magnitude of effect should be assessed in terms of the size and scale, geographical extent, duration and reversibility of the effect.

**A.28** These aspects are considered together, to form a judgement regarding the overall significance of visual effect (GLVIA3, Figure 6.1 Page 99). The following sections set out the methodology used to evaluate sensitivity and magnitude.

### Sensitivity of Visual Receptor

**A.29** The sensitivity of a visual receptor to change is defined as **high**, **medium** or **low** and is based on weighing up professional judgements regarding susceptibility and value, and each of their component considerations, as set out in the below.

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

### Susceptibility of Visual Receptors

**A.30** The susceptibility of visual receptors to changes in views/visual amenity is a function of the occupation or activity of people experiencing the view and the extent to which their attention is focussed on views (GLVIA 3, para 6.32). This is recorded as **high**, **medium** or **low** informed by the table below.

**Susceptibility of Visual Receptors**

| High | Medium | Low |
|---|---|---|
| Viewers whose attention or interest is focussed on their surroundings, including:<br>Communities where views contribute to the landscape setting enjoyed by residents;<br>Visitors to heritage assets or other attractions where views of surroundings are an important contributor to experience; and | People engaged in outdoor recreation (including users of cycle routes, footpaths and public rights of way whose interest is likely to be focussed on the landscape);<br>People travelling in vehicles on scenic routes and tourist routes, where attention is focussed on the surrounding landscape, but is transitory; and | People travelling more rapidly on more major roads, rail or transport routes (not recognised as scenic routes); and<br>People engaged in outdoor sport or recreation which does not involve or depend upon appreciation of views of the landscape; people at their place of work whose attention is not on |
| Formal or promoted stopping places on scenic or tourist routes. | People at their place of work whose attention is focussed on the surroundings and where setting is important to the quality of working life. | their surroundings (and where setting is not important to the quality of working life). |

### Value of View or Visual Amenity

**A.31** GLVIA3 also requires evaluation of the value attached to the view or visual amenity and relates this to planning designations and cultural associations (GLVIA3, Para. 6.37, Page 114).

**A.32** Recognition of the value of a view is determined with reference to:

- planning designations specific to views;
- whether it is recorded as important in relation to designated landscapes (such as views specifically mentioned in the special qualities of a National Scenic Area);
- whether it is recorded as important in relation to heritage assets (such as designed views recorded in citations of Gardens and Designed Landscapes (GDL) or views recorded as of importance in Conservation Area Appraisals); and
- the value attached to views by visitors, for example through appearances in guide books or on tourist maps, provision of facilities for their enjoyment and references to them in literature and art.

**A.33** A designated viewpoint or scenic route advertised on maps and in tourist information, or which is a significant destination in its own right, such as a Munro summit, is likely to indicate a view of higher value. High value views may also be recognised in relation to the special qualities of a designated landscape or heritage asset, or it may be a view familiar from photographs or paintings.

**A.34** Views experienced from viewpoints or routes not recognised formally or advertised in tourist information, or which are not provided with interpretation or, in some cases, formal access, are likely to be of lower value.

**A.35** Judgements on the value of views or visual amenity are recorded as **high**, **medium** or **low**.

### Magnitude of Visual Effect

**A.36** The overall judgement of magnitude of visual effect (nature of visual effect) is based on weighing up professional judgements on size and scale, geographical extent, duration and reversibility. Further information on the criteria is provided below.

### Size and Scale

**A.37** The scale of a visual change depends on:

- the scale of the change in the view with respect to the loss or addition of features in the view and changes in its composition, including the proportion of the view occupied by the proposed development;
- the degree of contrast or integration of any new features or changes in the landscape with the existing or remaining landscape elements and characteristics in terms of form, scale and mass, line, height, colour and texture; and
- the nature of the view of the proposed development, in terms of the relative amount of time over which it will be experienced and whether views will be full, partial or glimpsed.

**A.38** All changes are assumed to be during winter, representing a 'maximum case effect' or 'worst case effect' scenario with minimal screening by deciduous vegetation and trees. Note that wireframes and ZTVs prepared to illustrate potential visual effects are calculated on the basis of bare ground and therefore demonstrate the maximum extent of visibility possible, in the absence of buildings or vegetation. Where coniferous forestry is present, consideration is given to felling regimes if levels of screening by forestry are likely to change notably during the lifetime of the proposed development.

**A.39** In this assessment size/scale of visual change is described as being **large**, **medium**, **small** or **barely perceptible**.

### Geographical Extent

**A.40** The geographical extent of a visual change records the extent of the area over which the changes will be visible e.g. whether this is a unique viewpoint from where the proposed electricity transmission infrastructure can be glimpsed, or whether it represents a larger area from which similar views are gained. Geographical extent is described as being **large**, **medium** or **small**.

### Duration

**A.41** The duration of visual effects is reported as **short-term**, **medium-term** or **long-term**, as defined for the duration of landscape effects (see above).

### Reversibility

**A.42** Reversibility is reported as **irreversible** (i.e. permanent), **partially reversible** or **reversible**, and is related to whether the visual change can be reversed at the end of the phase of development under consideration (i.e. at the end of construction or at the end of the operational lifespan of the development). Operational visual effects associated with the New 132kV OHL have been considered to be reversible, as demonstrated by the decommissioning of the Existing 132kV OHL being replaced at the end of its operational life as part of the EDM Project.

**A.43** Judgements on the magnitude of visual effect are recorded as **high**, **medium** or **low** guided by the table below.

### Magnitude of Visual Effects

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

### Direction of Visual Effects

**A.44** The direction of visual effects (**beneficial**, **adverse** or **neutral**) is determined in relation to the degree to which the proposal fits with the existing view and the contribution to the view that a proposed development makes, even if it is in contrast to the existing character of the view.

**A.45** With regard to electricity transmission infrastructure and to cover the 'maximum case effect' situation, potential visual effects are generally assumed to be adverse.

### Judging the Level of Visual Effect and Significance

**A.46** As for landscape effects, the final step in the assessment requires the judgements on sensitivity of the visual receptor and magnitude of visual effect to be combined to make an informed professional assessment on the significance of each visual effect.

**A.47** The evaluations of the individual aspects set out above (susceptibility, value, size and scale, geographical extent, duration and reversibility) are considered together to provide an overall profile of each identified visual effect. An overview is then taken of the distribution of judgements for each aspect to make an informed professional assessment of the overall level of effect, drawing on good practice guidance provided in GLVIA3.

**A.48** The sensitivity of visual receptors may involve a complex relationship between a visual receptors (e.g. people's) susceptibility to change and the value attached to a view. Therefore, the rationale for judgements of sensitivity is clearly set out for each receptor in relation to both its susceptibility (to the type of change proposed) and its value.

**A.49** A rigid matrix-type approach, where the level of visual effect is defined simply based on the level of sensitivity combined with the magnitude of effect is not used. As such, the conclusion on the level of effect is not always the same. Although a numerical or formal weighting system is not applied, consideration of the relative importance of each aspect is made to feed into the overall decision. Levels of visual effect are identified as **none**, **minor**, **moderate** or **major** where moderate and major visual effects are considered significant in the context of the EIA Regulations.

**A.50** This determination requires the application of professional judgement and experience to take on board the many different variables which need to be considered, and which are given different weight according to site-specific and location-specific considerations in every instance. As such, the conclusion on the level of effect is not always the same. Judgements are made on a case by case basis, guided by the same principles as set out in **Diagram 6.1**.

## Cumulative Landscape & Visual Impact Assessment (CLVIA) Methodology

**A.51** The aim of a Cumulative Landscape and Visual Impact Assessment (CLVIA) is to identify any interactions with other types of development (including transmission infrastructure, wind farms/ other energy generation infrastructure or other larger scale development) which could result in further significant landscape and visual effects not identified within the primary LVIA.

**A.52** SNH has prepared guidance relating to the cumulative assessment: Assessing the Cumulative Impact of Onshore Wind Energy Developments. Whilst this guidance specifically relates to wind farms, many of the overarching principals are of relevance to this cumulative assessment. This guidance states that the aim of CLVIA is to: 'describe, visually represent and assess the ways in which a proposed windfarm would have additional impacts when considered together with other existing, consented or proposed windfarms' (Para. 55, SNH, 2012).

**A.53** The cumulative assessment therefore focusses on the additional cumulative change which may result from the introduction of a proposed development to a landscape with other existing or proposed developments. The cumulative assessment may also make reference to total (also referred to as combined) cumulative effects, where these have the potential to be significant.

**A.54** As with the LVIA, the CLVIA deals with cumulative landscape and visual effects separately.

### Differences between LVIA and CLVIA

**A.55** Although both LVIA and CLVIA look at the effects of a proposed development on the landscape and on views, there are differences in the baseline against which the assessments are carried out.

**A.56** For the primary LVIA, the baseline includes existing developments (including transmission infrastructure, wind farms/other energy generation infrastructure or other larger scale development) which are present in the landscape at the time of undertaking the assessment, and which may be either operational or under construction as they form a part of the baseline situation. Their presence has the potential to influence the assessment of effects on landscape character and the assessment of effects on views.

**A.57** For the CLVIA the baseline is partially speculative and includes two scenarios:

- **Scenario 1**: transmission infrastructure, wind farms/ other energy generation infrastructure or other larger scale development which have been granted planning consent but are not yet constructed (consented); and
- **Scenario 2**: scenario 1 developments plus submitted valid applications which are currently awaiting determination by the relevant consenting authority, including those at appeal and in some instances those currently at scoping when specifically requested (proposed).

**A.58** The cumulative assessment considers the operational and under construction sites, as well as consented and proposed sites, and differs from that contained in the primary assessment of landscape effects and the assessment of visual effects in that it focusses specifically on the cumulative impact of the proposed development in association with all other transmission infrastructure, wind farms/ other energy generation stations or other large scale developments and assesses the detailed relationship between them.

**A.59** Where the magnitude of change that would occur as a result of the introduction of the proposed development in the primary LVIA is identified as either low or barely perceptible, potential cumulative effects are often not assessed in the cumulative assessment as it is considered that such an addition would not give rise to a significant cumulative effect.

## Types of Cumulative Effects

**A.60** Assessing the Cumulative Impact of Onshore Wind Energy Developments states that 'cumulative landscape effects can impact on either the physical fabric or character of the landscape, or any special values attached to it' (Para. 48, SNH, 2012).

**A.61** Three types of cumulative effects on visual amenity are considered in the assessment: combined, successive and sequential:

- **Combined** effects occur where a static viewer is able to view two or more developments from a viewpoint within the viewers' same arc of vision (assumed to be about 90 degrees for the purpose of the assessment);
- **Successive** effects occur where a static viewer is able to view two or more developments from a viewpoint, but needs to turn to see them; and
- **Sequential** effects occur when a viewer is moving through the landscape from one area to another, for instance when a person is travelling along a road or footpath, and is able to see two or more developments at the same, or at different times as they pass along the route. Frequently sequential effects occur where developments appear regularly, with short time lapses between points of visibility. Occasionally sequential effects occur where long periods of time lapse between views of developments, depending on speed of travel and distance between viewpoints.

## Assessing Cumulative Effects

### Assessment Methodology for CLVIA

**A.62** The CLVIA considers the potential effects of the addition of a proposed development, against a baseline landscape that includes transmission infrastructure, wind farms/ other energy generation infrastructure or other larger scale development that may or may not be present in the landscape in the future, i.e. developments that are consented but not yet built, and/or undetermined planning applications. The developments included in each scenario are assumed to be present in the landscape for the purposes of the CLVIA.

**A.63** The methodology for the CLVIA follows that of the primary LVIA, which considers the introduction of a proposed development to a baseline which includes existing (operational and under construction) developments. The size and scale of cumulative change focusses on:

- the number of existing, consented and/or proposed developments visible;
- the pattern and arrangement of developments in the landscape or view, e.g. developments seen in one direction or part of the view (combined views), or seen in different directions (successive views in which the viewer must turn) or developments seen sequentially along a route;
- the relationship between the scale of the developments (similar scale developments or scales of development which are clearly at odds with each other);
- the position of the developments in the landscape, e.g. in similar landscape or topographical context;
- the position of the developments in the view, e.g. on the skyline or against the backdrop of land; or how the proposed development will be seen in association with another development (separate, together, behind etc.); and
- the distances between developments, and their distances from the viewer.

### Significance of Cumulative Effects

**A.64** As for a LVIA, judging the significance of cumulative landscape and visual effects requires consideration of the sensitivity and the magnitude of effect on those receptors. The following sections set out the methodology applied for the assessment of cumulative effects for both landscape and visual receptors and explains the terms used.

## Assessing Cumulative Landscape Effects

### Sensitivity

**A.65** An assessment of cumulative landscape effects requires consideration of the sensitivity of the landscape receptors. This requires consideration of susceptibility and value, and is as recorded in the LVIA baseline.

### Magnitude of Cumulative Landscape Effects

**A.66** Similarly to the methodology applied for an LVIA, the magnitude of cumulative landscape effect (nature of cumulative landscape effect) is based on combining professional judgements on size and scale, geographical extent, duration and reversibility. Judgements on the magnitude of cumulative landscape effect (nature of cumulative visual effect) are recorded as **high**, **medium** or **low**.

### Size and Scale

**A.67** The size/scale of cumulative landscape change is the additional influence the proposed development has on the characteristics and character of the area assuming the other transmission infrastructure/developments considered in the CLVIA baseline scenarios are already present in the landscape. This is influenced by:

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

### Geographical Extent

**A.68** As for the LVIA, the geographical extent over which the cumulative landscape change will be experienced is described as being **large** (scale of the landscape character type, or widespread, affecting several landscape types or character areas), **medium** (immediate surroundings) or **small** (site level).

### Duration & Reversibility

**A.69** For the purpose of the cumulative landscape assessment consideration of the judgements of the duration and reversibility of landscape effects are as recorded in the LVIA.

**A.70** Judgements on the magnitude of cumulative landscape effect are recorded as **high**, **medium** or **low**.

### Levels of Cumulative Landscape Effect and Significance

**A.71** The final step in the assessment of cumulative landscape effects requires the judgements of sensitivity and magnitude of cumulative landscape effect to be combined to make an informed professional assessment on the significance of each cumulative landscape effect.

**A.72** As for the LVIA the levels of cumulative landscape effect are described as **none**, **minor**, **moderate** or **major** where moderate and major cumulative landscape effects are considered **significant** in the context of the EIA Regulations.

**A.73** More significant effects are likely where:

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

**A.74** GLVIA 3 states 'The most significant cumulative landscape effects are likely to be those that would give rise to changes in the landscape character of the study area of such an extent as to have major effects on its key characteristics and even, in some cases, to transform it into a different landscape type. This may be the case where the project being considered itself tips the balance through its additional effects. The emphasis must always remain on the main project being assessed and how or whether it adds to or combines with the others being considered to create a significant cumulative effect' (para 7.28 GLVIA 3).

**A.75** This determination of cumulative landscape effects requires the application of professional judgement and experience to take on board the many different variables which need to be considered, and which are given different weight according to site-specific and location-specific considerations in every instance. Judgements are made on a case by case basis.

### Assessing Cumulative Visual Effects

#### Sensitivity

**A.76** The assessment of the significance of cumulative visual effects requires consideration of the sensitivity of the visual receptors. This requires consideration of susceptibility and value and is as recorded in the LVIA baseline.

#### Magnitude of Cumulative Visual Effects

**A.77** As for cumulative landscape effects and the methodology for the LVIA, the magnitude of cumulative visual effect (nature of cumulative visual effect) is based on combining professional judgements on size and scale; geographical extent; duration and reversibility. Judgements on the magnitude of cumulative visual effect (nature of cumulative visual effect) are recorded as high, medium, low or barely perceptible.

#### Size and Scale

**A.78** The size/scale of cumulative change to views depends on the additional influence the proposed development has on views assuming the other developments considered in the cumulative assessment are already present in the landscape. This is influenced by:

- whether the proposed development introduces development into a new part of the view so that the proportion of the developed part of the view increases;
- the relationship between the proposed development and other developments in terms of design, size and layout;
- the apparent visual relationship of cumulative developments to landscape character types and or landscape character areas; and/or

in the case of magnitude of change to routes, the relative duration of views of developments from routes.

**A.79** There has to be clear visibility of at least one cumulative development, of which one must be the proposed development, for there to be a cumulative effect (given this is an assessment of the effects of the proposed development and not a broader CLVIA of combined cumulative effects or capacity study). Where the proposed development is clearly visible and other developments are not, the effect is likely to be the same as recorded in the primary LVIA (i.e. the effect is not a cumulative effect).

#### Geographical Extent

**A.80** As for the LVIA, the geographical extent of cumulative visual changes records the extent of the area over which the changes will be visible e.g. whether this is a unique viewpoint from where the proposed development and other cumulative developments can be glimpsed, or whether it represents a larger area from which similar views are gained from large areas. Geographical extent is described as being large, medium or small.

#### Duration & Reversibility

**A.81** For the purpose of the cumulative visual assessment consideration of the judgements of the duration and reversibility of visual effects are as recorded in the LVIA.

### Levels of Cumulative Visual Effect and Significance

**A.82** The final step in the assessment of cumulative visual effects requires the judgements of sensitivity and magnitude of cumulative visual effect to be combined to make an informed professional assessment on the significance of each cumulative visual effect.

**A.83** As for the LVIA the levels of cumulative visual effect are described as none, minor, moderate or major where moderate and major cumulative visual effects are considered significant in the context of the EIA Regulations.

**A.84** The evaluations of susceptibility, value, size and scale, geographical extent, duration and reversibility are considered together to provide an overall profile of each identified visual effect. An overview is taken of the distribution of judgements for each aspect to make an informed professional assessment of the overall level of each visual effect, drawing on guidance provided in GLVIA3. Levels of effect are identified as none, minor, moderate or major where moderate and major visual effects are considered significant in the context of the EIA Regulations.

**A.85** Most significant effects are likely where:

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

**A.86** This determination of cumulative visual effects requires the application of professional judgement and experience to take on board the many different variables which need to be considered, and which are given different weight according to site-specific and location-specific considerations in every instance. Again, as for the assessment of landscape and visual effects, judgements are made on a case by case basis, guided by the same principles as set out in Diagram 6.1 above.

## Zone of Theoretical Visibility (ZTV) Production

**A.87** Evaluation of the theoretical extent to which both the existing and proposed overhead transmission infrastructure is visible across the study area is undertaken by establishing a ZTV.

**A.88** ESRI's ArcMap 10.5.1 software is used to generate the ZTVs. The Spatial Analyst/Viewshed tool does not use mathematically approximate methods, and the program calculates areas from which the wood pole structures are potentially visible.

**A.89** This has been performed based on a 'Bare Earth' computer generated DTM which does not take account of potential screening by buildings, woodland, vegetation or other surface features. Further detail about how the ZTVs have been generated and the data used is provided below.

#### Bare Earth ZTVs

**A.90** The bare earth DTM is comprised of OS Terrain® 5 (5m resolution) data across the 3km study area.It should be noted that the software uses raster height data, but while it is defined as continuous data (with each grid square referred to as a 'cell'), it assumes a single height value from the centre of that cell for the whole cell. Therefore, any height variations between centre points of cells will not be recognised.

**A.91** The DTM data has not been altered (i.e. by the addition of local surface screening features) for the production of the Bare Earth ZTV. No significant discrepancies have been identified between the DTM used and the actual topography around the study area. The effect of earth curvature and light refraction has been included in the Bare Earth ZTV analysis and a viewer height of 2m above ground level has been used.

- There are limitations in the use and reliance on this theoretical visibility, and these should be considered in the interpretation and use of the ZTV:
- The ZTV uses a 'bare ground' DTM model, and does not consider the screening effects of vegetation, buildings, or other local features that may prevent or reduce visibility;
- The ZTV is considered to over emphasise the extent of visibility of the proposed overhead transmission infrastructure and therefore represents a 'maximum potential visibility' scenario; and
- There is often a wide range of variation within the visibility illustrated by a ZTV, for example, an area shown as having visibility of a larger number of proposed steel lattice towers or wood poles may in reality only be the result of only a small proportion of the structures, which can make a considerable difference in the potential effects of the Proposed Development on receptors within the area affected by visibility.

**A.92** In light of these limitations, whilst ZTVs are used as a starting point to inform the assessment, providing an indication of where the proposed Development will theoretically be visible, the information drawn from the ZTV was verified with reference computer generated wireline images of the proposed EDM Project in the field, to ensure that the assessment conclusions represent the visibility of the proposed Development reasonably accurately.

## Photography

### Viewpoint Photography

**A.93** The methodology for undertaking viewpoint photography is in accordance with guidance from Scottish Natural Heritage (SNH, 2017) and the Landscape Institute (Landscape Institute (LI), 2011). The focal lengths used are in accordance with recommendations contained in guidance, and are stated on the figures. Photography was undertaken by LUC in Spring 2019. Nikon D600, D700 and D750 full frame sensor digital single lens reflex (SLR) cameras with a fixed 50mm focal length lens were used to undertake photography from all viewpoint locations.

**A.94** A tripod with vertical and horizontal spirit levels was used to provide stability and to ensure a level set of adjoining images. The cameras were orientated to take photographs in landscape format. A panoramic head was used in each instance to ensure the camera rotated about the no-parallax point of the lens in order to eliminate parallax errors between the successive images and enable accurate stitching of the images. The camera was moved through increments of 24˚(degrees) and rotated through a full 360˚ at each viewpoint. Fifteen photographs were taken for each 360˚ view.

**A.95** The location of each viewpoint and information about the conditions at the time of the photographs being taken was recorded in the field in accordance with SNH (SNH, 2017) and LI guidance (LI, 2011).

**A.96** Weather conditions and visibility were considered an important aspect of the field visits for the photography. Where possible, visits were planned around clear days with good visibility. Viewpoint locations were visited at appropriate times of day to ensure, as far as possible, that the sun lit the scene from behind, or to one side of the photographer. South facing viewpoints can present problems particularly in winter when the sun is low in the sky. Photography opportunities facing into the sun were avoided where possible to prevent the overhead transmission infrastructure appearing in silhouette. Adjustments to lighting of the overhead transmission infrastructure were made in the rendering software to make the infrastructure appear realistic in the view under the specific lighting and atmospheric conditions present at that time the photography was taken.

### Photography Stitching

**A.97** Photographic stitching software PTGui© and Adobe Photoshop© software was used to stitch together the adjoining frames to create panoramic baseline photography.

### Editing of Baseline Photography

**A.98** Existing electricity transmission infrastructure to be decommissioned and removed following commissioning of the proposed New 132kv OHL was removed from the baseline viewpoint photography where evident. This was undertaken using Adobe Photoshop© software

**A.99** Existing electricity distribution infrastructure to be permanently removed to facilitate the New 132kv OHL was also removed from the baseline viewpoint photography where evident.

## Visualisation Production

### Wireline Visualisations

**A.100** The software package 43d Topos was used to create a digital terrain model (DTM) from OS Terrain® 5 and OS Terrain® 50 height data. The DTM includes the proposed development extents, viewpoint locations and all landform visible within the baseline photography. Overhead transmission line infrastructure and viewpoint location coordinates were entered.

### Photomontage Visualisations

**A.101** Photomontages have been constructed to show the proposed infrastructure including the specified pole type and height. A default viewer height of 1.5m above ground level is used in the 43d Topos software, however on limited occasions this viewer height was increased by a small increment to achieve a closer match between the terrain data and photographic landform content.

**A.102** The next stage required the rendered overhead transmission infrastructure to be blended into the baseline photograph to create the photomontages. Adobe Photoshop© software was used to combine the images and mask out (remove) complete or partial elements of the proposed overhead transmission line infrastructure which were located behind foreground elements in the original photograph.

**A.103** A Shapefile containing areas of tree felling required was imported into 43d Topos software to determine visibility from closer viewpoints.

**A.104** Topos viewpoint exports were imported into Adobe Photoshop aligned with the photography and informed the removal of existing woodland in the photomontage images.

**A.105** Finally, where applicable the images were converted from Cylindrical Projection to Planar Projection using PTGui© software.

### Figure Layout

**A.106** Adobe InDesign© software was used to present the figures. The dimensions for each image (printed height and field of view) are detailed below and each viewpoint visualisation has been presented as follows:

- A3 Viewpoint location map;

**A.107** 90˚ Baseline photograph (cylindrical projection) and 90˚ Wireline image (cylindrical projection) below. Wireline image shows the New 132kV OHl and developments considered in cumulative assessment:

- Page size: 841 x 297mm.
- Up to four x 90˚ sections presented in this format.

**A.108** 53.5˚ Wireline image (planar projection);

- Page size: 841 x 297mm.

**A.109** 53.5˚ Photomontage image (planar projection) showing forestry removal where applicable.

- Page size: 841 x 297mm.
- Up to four x 53.5˚ sections presented in this format

**A.110** In certain views the removal of the Existing 132kV OHL or sections of the New 132kV OHL have not been shown in the 53.5˚ wireline images or photomontages. The provision of these highly detailed photomontages (and wirelines) has focused on the sections of view where there are key changes, most notably including changes seen on the horizon.

[i] Scottish Natural Heritage (2017) Visual Representation of Wind Farms Guidance, Version 2.2
[ii] Landscape Institute (2011) Advice Note 01/11, Photography and photomontage in landscape and visual impact assessment
[iii] Landscape Institute (2017) Technical Guidance Note 02/17: Visual Representation of Development Proposals
[iv] The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations (2017) (as amended)
[v] https://www.nature.scot/professional-advice/landscape/landscape-character-assessment/landscape-character-assessment-scotland