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PART 3

GUIDANCE ON LANDSCAPE AND VISUAL IMPACT ASSESSMENT

CUMBRIA WIND ENERGY SUPPLEMENTARY PLANNING DOCUMENT

CONSULTATION DRAFT

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INTRODUCTION

Aim and Basis

This guidance seeks to define the requirements for the landscape and visual impact assessment (LVIA) of proposals for wind energy development within Cumbria in order to ensure that such assessments are:

- **Comprehensive:** cover all the significant issues whilst being focused and succinct.
- **Credible:** provide high quality information representing current best practice.
- **Effective:** are part of an iterative process of development planning and design through which best environmental fit may be achieved.
- **Consistent**: provide levels of information that are comparable between different developments.
- **Legible:** communicate information easily and provide a true impression.

This guidance has been developed using the second edition of the Guidelines for Visual and Landscape Impact Assessment (GLVIA)[1] and tailored to suit the complex effects arising from second and third generation wind turbines observed within Cumbria and recorded in recent studies[2] [3].

It is recognised that it is the primary responsibility of the landscape professionals carrying out the LVIA to develop a methodology appropriate to the nature, location and scale of the development proposal and the potential sensitivity of the site. This methodology should be appended to the LVIA and preferably agreed with the regulatory authority prior to the assessment. As a general principle the methodology should clearly describe the assessment process and most importantly spell out the criteria used for professional judgements in predicting effects and determining significance.

Definition of Landscape and Visual Effects

In PPS 22 the Government recognises that “Of all the renewable technologies, wind turbines are likely to have the greatest visual and landscape effects”[4]. These are independent but related issues and the GLVIA makes the following distinction “landscape effects are changes in the landscape, its character and quality, whilst visual effects relate to the appearance of these changes and the resulting effect on visual amenity”.

Cumulative Effects

Cumulative effect is a complex issue which will be increasingly relevant to the assessment of wind energy schemes as more and larger developments are proposed. For any given proposal developers should determine whether cumulative landscape and visual impact assessment (CLVIA) is necessary by reference to the requirements set out in Part 1: Chapter 4. The guidance on CLVIA has been adapted from guidance issued by Scottish

Natural Heritage[5] and ODPM[6] to suit the landscape and experience of cumulative effects in Cumbria.

When is an Assessment Needed?

The statutory framework for Environmental Impact Assessment (EIA) provides the basis for the methodology*. However the GLVIA recognises that the *'EIA process may benefit other projects, for which EIA is not formally required, in helping to achieve environmentally sensitive and sustainable development*'. The Companion Guide to PPS 22[6] advises that the issue of landscape and visual impact should be considered in relation to smaller renewable energy applications that do not require full EIA highlighting it as a specific issue with regard to wind, because of the large scale of turbines, and one that local planning authority may require information on. Consequently the following guidance applies to LVIAs reported in either a formal environmental statement (ES) or any informal information accompanying a planning application. It is recognised that the level of detail in the LVIA will need to be tailored to suit the size of development and consultation and agreement on this is expected with the planning authority and relevant statutory consultees.

Treatment of Turbine Size

The guidance is written on the basis of experience of on-shore turbine structures in Cumbria to date (ie maximum overall height to blade tip around 120m). As and when new models are introduced which are larger than this, due allowance will have to be made in applying the guidance.

Document Structure

The structure of this guidance is framed around the relevant chapters of an Environmental Statement (ES) including the initial chapters of site selection and project description common to other environmental topics. Questions are highlighted in the margins to alert readers to issues frequently raised by wind energy development in Cumbria. These serve as a checklist for the scope of issues to be covered in the LVIA alongside additional site specific issues emerging from scoping and consultation exercises for each individual proposal.

Iterative Process of Project Design and LVIA

It is stressed that developers are expected to involve a suitably experienced landscape architect from the beginning of the EIA process. Landscape and visual aspects should be set alongside economic and technical requirements as well as other environmental considerations at all stages of project development. Site selection and the initial design should be informed and

* DETR Circular 02/99 Environmental Impact Assessment advises that an EIA is more likely to be required for commercial developments of 5 or more turbines, or more than 5 MW of new generating capacity. This advice is still current, however, given the increased generating capacities of turbines this indicative threshold in practice translates to developments of 3 or more turbines.

respond to an ongoing LVIA. If proposals are to meet the high standards of siting and design set out in the planning policy framework it is essential that landscape and visual considerations are primary in the siting and overall concept for the layout. Wind energy developments will be visible and both individual turbines and groupings of turbines should be carefully designed as three-dimensional objects or groups of objects (compositions) within the landscape[7]. This assessment guidance should be read in conjunction with the guidance on siting and design contained in Part 1: Chapter 5. This iterative approach is illustrated in Figure 1.

Figure 1: The Iterative Design Approach

Project Design Stage	Landscape Design Stage		Link to LVIA
Feasibility and Site Selection (including comparative site appraisals)	Strategic overview of location	Confirm location in the broad landscape context is acceptable in and identify appropriate development size thresholds.	Initial evaluation through desk study of broad landscape context by reference to the main landscape type descriptions and their capacity indicated in Part 2 of the CWESPD.
	Siting and initial sizing	Test suitability of specific site against landscape sensitivity and value criteria (CWESPD Part 2 Tables 1 & 2) and determine appropriate form of development e.g. large cluster related to geometric field pattern. Refine in response to scoping exercise and preliminary survey and analysis.	Scoping study identifying main issues through desk study of local landscape setting by reference to the landscape sub-type descriptions, preliminary site survey to confirm this and preliminary ZVI key receptor analysis. Identify any significant infrastructure issues e.g. access or grid connection.
Conceptual Design (including assessment of alternative design options)	Composition/ Outline Layout	Initial design as a 3D object in terms of height, number and arrangement of turbines, orientation to find the optimum relationship with the local landscape character and visual composition with the main elements of the landscape setting appreciated from key views.	Study the baseline conditions and identify critical constraints through analysis of key sensitivity characteristics of the local landscape setting e.g. broad scale and enclosure, complexity, order and broad patterning; key receptors and modifying factors in the landscape setting relevant to these e.g. screening, contrast, framing.
Detailed Layout Design	Micro-siting	Design to protect and minimise damage to features and maximise opportunities for screening and landscape integration. Respond to micro-siting proposals led by engineering and other environmental consideration e.g. ecology, archaeology and noise to ensure that the 3D composition in the wider landscape setting is not subverted.	Study the baseline conditions of the site, access routes and immediate landscape setting; identify detailed patterns and key landscape features combined with analysis of the nature of the site's visibility from key close range receptors.
Component Design	Detailed design of turbines, infrastructure and ancillary developments	Devise strategies and parameters for turbine design (e.g. colour and reflectivity), ancillary structures, access tracks, buildings, reinstatement, and landscape mitigation measures to reduce or off-set adverse effects, such as replacement of hedgerows, removal or downgrading of access tracks.	Analysis of compositional qualities relative to key receptors e.g. dominant background and character of local elements and features and extent of potential damage to those on site.
Secondary Mitigation	Detailed design of off-site mitigation measures and land management proposals	Design measures to reduce visual effects (e.g. off-site planting to screen specific receptors). Devise long term measures to directly compensate for adverse effects (e.g. loss of hedgerow) off-set by hedgerow restoration and general landscape enhancement to off-set unrelated damage (e.g. restoration of heather moorland).	Identification of residual adverse effects to landscape and visual amenity. Analysis of value and condition of characteristic elements and features with reference to management guidelines e.g. Cumbria Landscape Strategy.

SITE SELECTION

Alternatives Considered and Selection Rationale

Describe the alternative sites considered and their landscape constraints/opportunities. Indicate why the final choice was chosen and why it was considered suitable in terms of potential landscape and visual effects.

It is a requirement of the EIA regulations to provide an outline description of the main alternatives considered and an indication of the main reasons for the final development choice. This should reduce misinformed criticism and demonstrate how environmental factors have been taken into account. Increasingly, consideration of alternatives even for projects outside EIA requirements is seen as good development practice. It helps to demonstrate that proposals meet the high standards of siting and design set out in Planning Policy Statement 22, and regional and local planning policies.

THE PROPOSED DEVELOPMENT

Alternative Compositions Considered

Describe the alternative conceptual design options considered. Recent experience has shown that with regard to landscape and visual impacts the most crucial considerations are turbine heights, numbers of turbines, layout configurations and orientation of groupings. The assessment should describe and illustrate these alternative 3D compositions and explain why the preferred solution represents the optimum fit e.g. demonstrate that the height of turbines is appropriate to the scale of the receiving landscape and the orientation presents the best aspects of the development relative to key visual receptors draft Zones of Visual Influence (ZVI) and wireframes would provide appropriate illustration).

Design Philosophy and Primary Mitigation Measures

Describe the design principles, landscape criteria and rationale adopted. The primary means of mitigating the impact of wind turbines will be through careful consideration of siting, 3D composition, detailed layout and component design that achieves the optimum landscape fit, and avoidance of visual dominance and intrusion as part of an environmentally integrated and iterative design process. Primary mitigation measures that avoid or reduce adverse landscape and visual effects are therefore best described as design iterations within this section of the ES or Supporting Information.

Description

Describe each stage of the development project life cycle in sufficient detail to identify landscape and visual effects including:

- Form - shape, bulk, and orientation.
- Materials - colour, reflectivity and texture.

- Location and physical dimensions of major construction plant, delivery vehicles, buildings, structures and site areas under different uses.
- Movements of turbine blades, construction plant, materials and work force.
- Construction and reinstatement methods.
- Duration of the life cycle stage.

Relevant activities and project elements requiring description are:

Construction Phase

Will there be any off-site damage to landscape fabric due to easement or widening requirements to accommodate large turbine components?

Is the detailed site layout integrated with the landscape pattern, have losses been minimised, damage to sensitive features and habitats avoided and screening potential maximised?

Have all elements that are not essential to the operation of the development been removed and can others such as internal tracks and the site access be downgraded at the end of the construction phase to reduce landscape impacts?

- External access and haulage routes for construction and delivery vehicles.
- Site access from the public highway meeting including turning circle and visibility splay requirements.
- Removal and protection of existing features.
- Internal site access tracks (noting any that are temporary or that may be reduced in width on completion of construction phase, any cut and fill or drainage requirements).
- Site cable runs.
- Borrow pits and disposal areas.
- Temporary lay down areas and crane hard standings.
- Contractors compound for temporary accommodation, parking and storage of materials and plant.
- Turbine foundations.
- Temporary anemometer.
- Site reinstatement.

Operational Phase

Can site conditions and vegetation be reinstated; are there any opportunities for improving landscape character, what are the relevant timescales?

Has site clutter been minimised e.g. incorporation of transformer in base of turbine tower; under grounding cables?

- Number and type of turbines.
- Transformers.
- Substation compound and switch gear/metering building.
- Grid connection.
- Signage and fencing.
- Landscape mitigation measures.
- Operational wind speeds and turbine blade rotation speed.
- Servicing and emergency operations.
- Land management operations and objectives.

Decommissioning Phase

- Removal of the turbines, ancillary structures e.g. the sub-station, infrastructure e.g. site access, internal tracks, external road easements or widening, overhead power lines.

- Reinstatement e.g. covering foundations and re-seeding.
- Future land management.

BASELINE CONDITIONS

Area of Study

The ZVI of turbines extends over a considerable area and the nature and magnitude of effects varies with the range from the proposal. Since an ES is required by regulation to assess potential significance, as a minimum the study area should cover a range within which significant impacts could potentially occur. This will entail a consideration of the perceived size and intensity of visual effect at different ranges (see references [2] [3] [8] and Appendix 1) and sensitivity of the receptors. Given the scale of current third generation turbines (95-120m to blade tip) 18km is considered to be a minimum radius for the ZVI and study area for a stand alone scheme. This reflects the limit of potential visual significance. The presence of receptors of exceptionally high sensitivity such as a National Park or Area of Outstanding Natural Beauty landscapes or a significant viewpoint like a popular mountain peak, would be expected to extend the range, with 30km considered to be a maximum radius. Determination of the study area extent should be fully justified in relation to these aspects.

Cumulative Study Area

Where CLVIA is required the cumulative ZVI and study area should have a minimum radius of 30km from the centre point of the new proposal. However, the Planning Authority may request an extension of the study area to address specific cumulative issues. This should normally decided at the scoping stage of the project with decisions informed by a base plan of all existing consented proposed and relevant prospective schemes within a 60km radius (see Part 1: Chapter 4).

Viewpoints and Routes

Identify and justify the selection of representative viewpoints routes used for assessment of landscape and visual effects. Tables indicating each viewpoint location, range, receptor type and reason(s) for selection are useful in this respect. Early draft ZVIs can help the Planning Authority and consultees to advise on the selection of fixed viewpoints and routes for sequential visual assessment. These should be agreed at the scoping stage or during the baseline studies for the EIA and chosen to represent:

Have settlements, important footpaths or roads etc been carefully investigated to locate viewpoints representing the best vantage point of the proposal?

Have all the relevant landscape and visual receptors been identified at each viewpoint?

- The range of landscape character and visual receptor types at different points on the compass and distances relative to the development.
- Key views (or sequences of views) where the most significant effects are anticipated e.g. highly valued landscapes/ townscapes/ ‘gateways’ or settings, established public viewpoints, settlements, tourist

destinations, regularly used strategic transport and recreation routes.

- Locations where cumulative effects will occur with other wind turbines either in combination or succession from fixed positions or in sequence on a journey (within areas of ZVI overlap).

The number of viewpoints required will depend on the size of the proposal and site sensitivity but is likely to be around 15 – 25. These should increase exponentially with proximity to the proposed development so that the majority are within the mid to close ranges. Wireframe visualisations should be used to illustrate the potential changes in view at all the viewpoints and supplemented by photomontages at a selection of viewpoints agreed with the planning authority. It is recommended that priority should be given to close and mid range views (i.e. within 2.4km and 6km) and to receptors of highest sensitivity. The total number of photomontages required will again depend on the size of the proposal and site sensitivity, but 5 are regarded as an absolute minimum.

Precise locating of viewpoints should follow thorough field investigation to ensure the 'worst case situation' is assessed for the relevant receptor.

Format of Landscape Descriptions

Experience has shown it appropriate to consider the baseline landscape and subsequent assessments within the ranges expressed below which in turn relate to variations in the appearance or perception of wind turbines described in Appendix 1. This approach also has the advantage of linking into the iterative design process described in Figure 1 and addressing the effects created by interrelationships between landscape types and sub-types within a landscape setting. Connection with adjacent landscapes is recognised as a key sensitivity characteristic for wind proposals (see Part 2 Appendix1).

- **Broad Landscape Context** (within 18-30km)**:** Describe by reference to the existing regional classification of landscape character areas [9] and the county level classification of main landscape types[10] [11].
- **Local Landscape Setting** (within approx 12km)**:** Describe by reference to character descriptions for landscape sub-types in the county level classification[10] [11]and confirm key characteristics, described in the capacity assessments in Part 2, by rigorous field survey and analysis from the representative viewpoints.
- **Immediate Landscape Setting** (within approx. 2.4km)**:** Describe the key characteristics within close range by field survey and analysis from the representative viewpoints.
- **The Site:** Describe the detailed topography, land use, vegetation, features of landscape ecological, cultural or archaeological interest, access points, and rights of way through detailed site survey and analysis.

Description of Landscape Resource

Within this framework use a structured approach to describe the landscape resource in terms of the following receptors:

- **Physical Fabric:** Elements (main parts), e.g. ridges, valleys, woodland, pastureland, fabric of walls and hedges, settlements and features (eye-catching details), e.g. crags, streams, hedgerow trees, masts, chimneys, farm buildings, views. This may pertain to landform, land cover, culture and land use.
- **Characteristics:** Characteristic patterns, combinations and interactions of the above elements and features which make a particular contribution to the sense of place. Include aesthetic factors (scenic qualities), such as scale of landform, grain of hills and ordered pattern of geometric fields, confusion of elements; and the way it is perceived (impression conveyed), e.g. tranquil, picturesque, remote, wild, industrial, managed, historic.
- **Overall Character:** Combination of physical fabric and characteristics making up a distinct and consistent character in a particular type of landscape.

The physical fabric of a landscape is generally quantifiable, easily and objectively described. With regard to landscape characteristics aesthetic factors can still be "recorded in a rational, rigorous and standardised, if not wholly objective, way"[12]. They are distinct from the perceptual aspects of landscape character, which are much more subjective and where responses to them will be more personal and coloured by the experience and the preferences of the individual[13]. Aesthetic and perceptual aspects are both important dimensions of character which will lie at the heart of any acceptability judgements. The original Cumbria Landscape Classification[10] should be referred to as it crucially describes these in a section entitled 'Subjective Impression' in each landscape sub-type description.

Landscape Sensitivity

Even if a landscape has been damaged does it still have a local value in providing 'green' relief between built up areas or recovering towards a richer landscape after previous development e.g. opencast mining?

The GLVIA explains that sensitivity is derived by a consideration of the intrinsic characteristics of the receiving landscape and their evaluation. The degree to which a particular landscape can accommodate change will vary according to intrinsic characteristics. Those exhibiting particular sensitivity to wind development have been defined as key characteristics in Part 2: Table 1. They determine tolerance to change which is tested out on application of a specific proposal and reflected in the impact magnitude scores. They should not be double counted as part of sensitivity for the purposes of weighting the significance of effects. In this respect sensitivity should be restricted to the evaluation of the landscape resource.

Classify and justify the relative sensitivity of elements, features, characteristics and overall character using a textual scale. A scale of 4 - 5 levels such as that used by the DETR (GLVIA

Appendix 6) is preferred given the diversity of landscapes occurring in Cumbria. Judgements should reflect such factors as:

- **Landscape Dynamics and Condition:** Indicate the extent to which the landscape is changing and the likely direction and rate of change together with the likely future character of the landscape without the proposal. This will provide a yardstick for the impact of the proposed development. Take account of the Cumbria Landscape Strategy[14] which provides land management guidelines for individual elements and features. Refer to the overall state of the area e.g. degraded and condition of individual elements e.g. buildings hedgerows.

Is there scope for the development to contribute to the restoration or enhancement of the landscape?

- **Landscape Value:** Describe the value and importance of the landscape components. Identify at what geographical scale it is important, who it is important to and why.

  Refer to the key indicators of value defined in Part 2: Table 2, and confirm the evaluations in the capacity assessments. In addition acknowledge local designations and perceptions of value through consultation with the local authority, local amenity groups and residents or visitors at the scoping stage. Within Cumbria values are likely to include the contribution a landscape makes to tourism or image in relation to economic development.

Description of Visual Context and Importance

Does the site contribute to any valued settings e.g. to a settlement or valued landscape? Is it already the focus of attention e.g. landmark ridge or hill?

Within the Zone of Visual Influence (ZVI) review and confirm the visual enclosure and interruption characteristics described in the capacity assessments. Describe the site's local contribution to visual amenity and the compositional qualities as observed in key views. Key views are defined in Part 2: Appendix 1, and include those from settlements, strategic transport and recreation routes, public open spaces, established viewpoints and tourist destinations as well as settings or 'gateways'. Significant visual effects are most likely to occur in the close (2.4km) and middle (6km) distance ranges so the description should concentrate and be structured according to these. Identify factors likely to modify visual effects and apparent size of proposals such as valley rims; visual corridors; deflection, screening, filtering or framing by mid /foreground elements or features; background screening; presence of visual clues or scale indicators; elevation above key views.

Visual Receptor Sensitivity

Classify and justify the relative sensitivity of different types of receptor including communities; occupiers of residential properties and caravans; users of outdoor recreational facilities; and people travelling through or past the affected landscape using a textual scale with 4 - 5 levels.

Distinguish between users of outdoor recreational facilities whose attention is focused on the landscape, for example walkers (high sensitivity) and those whose attention is focused on an activity e.g. wind surfers (low sensitivity). Consider if the landscape

setting to settlements is valued and enjoyed by the community. Distinguish between the different levels of familiarity and expectations between residents and visitors or tourists. As with landscape value specific visual receptors are likely to have relevance to assessment of effects on tourism or economic development.

ASSESSMENT OF EFFECTS

General

This section should:-

- Systematically describe the likely effects of the proposal.
- Indicate the primary and secondary mitigation measures.
- Estimate the magnitude of the effects.
- Provide an assessment of the nature (adverse/ neutral/ beneficial) and significance of these effects supported by clear evidence and reasoned argument.

Focus on the potentially significant effects which have preferably been agreed with the consultees at the scoping stage. Consider changes likely to be brought about by the proposal at various stages of the project life-cycle: construction, operation and, where appropriate, decommissioning and after-use. The duration of expected impacts, whether they are likely to be permanent or only temporary, should also be made clear.

Distinguish between direct and indirect effects. A direct (or primary) effect would be attributable to a proposal itself, for example a physical effect on landscape elements such as removal of a hedgerow to create an access; or visual appearance effect on landscape characteristics such as creating a strong vertical accent in a landscape of subdued relief. An indirect (or secondary) effect is not a direct result of the development but may be delayed in time or produced away from the site such as subsequent car park and signage in response visitor interest; off-site extraction of stone; traffic generation and grid connections.

Format and Description of Landscape Effects

In the first instance describe the predicted landscape change arising at each representative viewpoint. Extrapolate the findings to describe the more general landscape changes in respect of the physical fabric, characteristics and the consequential effect on the overall landscape character. In recognition of the variation in turbine and landscape appearance with distance the description of landscape effects should again be structured according to four ranges established at the baseline stage (see baseline conditions section above).

Will the proposal have a confusing and variable relationship with character because it will be seen against a variety of landscape types?

Will the proposal appear as a single cohesive feature through unity of turbine type and appropriate spacing between turbines?

- **Physical Fabric:** Wherever possible quantify effects such as physical damage or loss, improvements or gains to landscape elements and features, i.e. area of heather or length of stone walling/hedgerow lost; extent of replacement

planting.

- **Characteristics:** By reference to the criteria set out in Part 2: Table 1, systematically consider how the visual appearance of wind turbines, their blade movement and noise will affect the key characteristics sensitive to the proposal. This will cover both aesthetic aspects such as scale or pattern and perceptual aspects such as tranquillity and wildness. Whilst the latter are more subjective varying perceptions should be acknowledged since they often lay at the heart of debates on acceptability. Describe how the proposal will be typically seen, for instance will it be intermittently or widely visible? Within the immediate landscape setting include a description of how the visual appearance of the detailed layout, site infrastructure and ancillary structures will affect local characteristics.

What image does the landscape convey e.g. managed; wild; degraded; urbanised; industrial; rural; exposed. What kind of image will the proposed development possess in relation to this?

- **Overall Character:** Overall will the development appear to weaken, maintain or reinforce the character of the landscape? What kind of image will the proposal possess in relation to the landscape? Will it be perceived as being positive/neutral/negative? How well it is designed and sited in relation to the landscape setting of the site will have an important bearing on this.

Format and Description of Visual Effects

Describe the general extent and pattern of visibility by reference to the ZVIs. Highlight any significant topographic features that limit visibility or create areas of shadow. Qualify the topographic model by reference to any significant screening or interruption by tree cover or buildings.

In the first instance describe the predicted change in the view from each representative viewpoint. Extrapolate the findings to provide a general summary of the likely visual effects on high sensitivity receptors within this ZVI and key views (as described above). This summary should convey an overall picture of the extent of significant effects on visual amenity. The summary should be structured in some way for instance by range, receptor type, or compass direction.

The level of detail should relate to the range and potential significance of effects for instance in the close range (within 2.4 km) quantify and describe effects on individual properties as well as groupings in settlements and towns; in the mid range (2.4 - 6 km) reduce the level of detail to a summary of the general pattern of likely effects on individual properties and settlements. Pick out any significant effects on middle to long range receptors (beyond 6km).

Will the proposal appear separated from nearby landscape features, creating a simple focal point and avoiding visual confusion with over elements?

Will the development appear visually stable in relation to landform it is placed on?

Describe the change in the view by comparing the existing view with that which would result if the development went ahead by reference to:

- **Compositional Qualities:** Describe how the proposal is likely to read in terms of extent of visibility, prominence (see typical descriptors in Appendix 1) and response to the compositional quality of the view. Consider how the development will appear in relation to key elements and

features in the landscape setting and respond to existing visual forces. How it will look as a basic visual element in the landscape for example in relation to the skyline, the coastline, hill shapes, other vertical structures and landmarks. Consider whether a harmonious composition has been achieved through iterative siting and design measures as described in Part 1: Chapter 5 (mitigation). Describe the composition not only between the wind turbine and the landscape elements but to each other. Identify and explain how certain modifying factors in the landscape (as described in the baseline conditions section above) may tend to reduce or intensify the magnitude of the impact. Note any intrusive or disturbing effects such as blade overlap, proportional visibility or over dominance.

- **Journey Scenarios:** In relation to walkers or travellers it will be relevant to describe the sequential view with reference to constancy, degree of screening or interruption and resultant effects e.g. transient, surprise or glimpsed views.

Format and Description of Cumulative Effects

Describe cumulative effects in terms of the change to both landscape character and visual amenity brought about by the combined effects of the proposal and other existing or proposed developments. Identify the extent to which the proposal would add additional impacts. Use the cumulative sensitivity criteria set out in Table 3, Part 1: Chapter 4 as a checklist for systematically identifying both cumulative landscape and visual effects. It is important that the landscape and visual assessments should take account not only of the number of individual turbines, but also of the number of separate developments.

Landscape

Will the proposal portray a clear simple image by appearing well and consistently related to the landscape characteristics, visually separated and create a predictable rhythm through similarities in composition and placement in the landscape?

Will there be a confusing and bewildering combination of wind developments because of visual overlaps, variable design and relationship to landscape?

In the first instance describe the predicted change in the view from each representative viewpoint. Analyse the cumulative ZVI and describe the geographical area(s) where the combined effects between the proposal and other wind developments would be shared. Identify the wind developments contributing to those effects and the landscape sub-types that make up those areas. By extrapolating the findings from the representative viewpoints describe the cumulative landscape effects on each area by reference to:

- **Physical Fabric:** Two or more developments may cumulatively affect landscape elements or features; wherever possible quantify combined effects such as physical damage or loss, improvements or gains.
- **Characteristics:** Consider how the developments relate to each other i.e. do they appear to form a singular collective feature in the landscape or as separate, disunited individuals. Consider their relationship to the receiving landscape characteristics, for example complementing an existing repetitive pattern or conflicting with a sense of

remoteness and solitude. Some characteristics may lend themselves to cumulative development whilst others may constrain it.

Visual

Will the viewer(s) feel uncomfortably surrounded by wind developments or will two developments create unresolved duality whereby the eye jumps from one to the other?

Does the configuration of the view in terms of skyline, relative elevation or framing make wind developments appear disproportionately dominant or overbearing?

Do the developments impinge or detract from existing focal points or distort the sense of scale or distance?

In the first instance describe the predicted change in the view from each representative viewpoint. Extrapolate the results to summarise the extent to which, taken together, a significant proportion of resident and visitor experiences will be significantly changed. Describe combined visual effects of developments by reference to:

- **Compositional Qualities:** Consider how they will appear in relation to each other. Consider how they will balance with other elements or respond to existing visual forces in the composition and how effects maybe modified by the view configuration.
- **Journey Scenarios:** Consider sequential visibility by walkers, riders and cyclists as well as motor or rail travellers. Describe the manner, duration and frequency with which wind turbines may be seen while travelling through a landscape and how this may affect the perception of the landscape as a whole. Speed of travel needs to be taken into account. The cumulative impression created by seeing two wind farms in an hour's driving is of a quite different (lesser) order from seeing two in an hour's walk.

Will views be glimpsed with disconcerting sudden/partial visibility of turbines above the horizon or prolonged with predictable relationships between turbines and skyline?

Taking account of on the speed of the observer and /or the distance between viewpoints will turbines appear frequently or occasionally?

Where proposals are extensions or adjacent to existing wind development, the cumulative effect is essentially one of enlargement and the CLVIA should consider the effects of both developments as a single entity on the pre-development landscape (see Part 1: Chapter 4). Where a proposal is suggested within about 6km of another, in addition to the general issue of cumulative effect, there are important issues of compatibility in terms of turbine size, density, design, layout and overall cohesion that should be considered (see Part 1: Chapter 5).

Magnitude of Effects

Categorise the magnitude of effects using a textual scale, for example negligible, low, medium, high, and very high for both adverse and beneficial effects. A scale of 4 - 5 levels is preferred as research has found it to be more representative of the diversity of size (magnitude) found in visual impact assessment[2]. The typical criteria for each level should be defined in the methodology and are expected to make reference to the following:

Landscape Effects:

- Extent of physical change to key elements or features.
- Extent of the area subject to change and prominence of turbines.
- Degree of variance or compatibility between turbines and each key characteristic of the baseline landscape.

- Degree of change to overall character and image brought about by incremental and combined effects on key characteristics.

Visual Effects:

- Extent of visibility and the number and proportion of turbines that would be visible.
- Proportion of the view occupied by the proposal which relates to the distance of the viewpoint from it and breadth of the existing view.
- Apparent size and prominence taking account of modifying factors in the view likely to reduce or intensify this e.g. degree of contrast, framing, scale cues, backgrounding[2] and disturbing effects e.g. proportional visibility.
- Degree of contrast or integration with the character of existing elements e.g. scale, texture, form and design resolution with the visual dynamics of the composition e.g. stability, cohesion, separation.

Following the principle of the 'worst case situation'[1] evaluation in winter is preferred when leaf cover and therefore vegetative screening and/or filtering are minimal. In any event seasonal variations should be noted.

Cumulative Effects:

Criteria used to categorise the magnitude of cumulative effects are expected to make reference to the following:

- Relative impact of each individual wind development according to the above.
- Extent of combined influence (reflected by overlaps in ZVIs and visual interruption).
- Degree of variance or compatibility of multiple wind developments with key characteristics of the baseline landscape.
- Degree of change to overall landscape character (see definitions in Part 1: Chapter 4).
- Frequency and duration of sequential views.
- Proportion of view occupied by multiple developments.
- Apparent prominence reflecting number, scale and proximity (density) of wind developments or turbines and taking account of modifying factors in the configuration of the view.

Nature of Effects

Determination of the nature of a proposal's effects (ie adverse/ neutral or beneficial) is not a clear cut matter because of the varying responses of individuals to wind development, and the varying ways a landscape is perceived. The expectation of the viewer and their familiarity with wind

development will have a bearing on this. In terms of landscape aesthetics assessment should be more straight forward. Proposals that complement key characteristics* and create stable harmonious compositions with key landscape elements are more likely to be positively received. Variations in landscape perceptions and likely responses to the proposed wind energy developments should be highlighted in any assessment since they will often lie at the heart of considerations of acceptability. It is therefore preferable to separate out the nature of effects from considerations of magnitude.

Significance

Categorise the significance of effects using a textual scale, for example 7 levels from negligible to major. The two principal criteria determining significance are magnitude of effect and sensitivity of the receptor. In line with the best practice advocated by Newcastle University[2] the use of matrices setting out the main correlations between these two variables is preferred. These make the link between magnitude and sensitivity explicit and are considered to be a helpful tool in mapping and explaining the basis for the judgements made. In reality the theoretical position indicated by these matrices may need adjustment according to particular circumstances. These are a matter for professional judgement and they should be supported by a thorough justification where appropriate.

The level of significance should be qualified according to the nature of the effect, duration, i.e. short, medium, long term or permanent, and the geographical scale it is significant at, for example, local, regional, national or international. The number of people affected is also likely to be relevant with regard to significance of visual effects.

Given the complexity and size of wind energy projects it will generally be appropriate to provide separate assessments of the effects on each component of the landscape i.e. elements, characteristics, and resulting effect on overall character at each of the different range bands established at the baseline stage.

A record of the landscape analysis and the visual analysis at each viewpoint and visual extrapolations should be provided through tables or schedules appended to the LVIA. These should systematically set out: location, distance to nearest turbine, angle and elevation, landscape component type or visual receptor type and number, sensitivity, description of the change to the landscape or view, magnitude, nature and duration of change, and likely significance. This approach will increase the transparency of the assessment process.

Secondary Mitigation

Secondary mitigation measures should be designed to specifically

*Normally through a comfortable fit e.g. with scale of landscape elements but sometimes through simple contrast e.g. isolated vertical on horizontal plain whereby the magnitude of change is high but not necessarily adverse.

address the remaining (residual) negative (adverse) effects of the final development proposals. These would include 'add-on' measures such as off-site screen planting relative to a specific visual receptor to remedy the negative effects of an otherwise fixed design scheme. These should be seen as distinct from landscape integration measures developed as part of the iterative design process and identified as design iterations within the project description.

Compensatory measures or related environmental improvements may offset unavoidable residual effects, for example the loss of hedgerow to site access offset by restoration of remaining hedgerows. In general compensation should be regarded as a last resort and treated with caution. Some mature habitats may be irreplaceable or take centuries to replicate.

Experience has shown that wind energy developments present opportunities for enhancing the landscape. Although often linked to mitigation, enhancement is a separate issue that explores opportunities to contribute positively to the landscape of the development site and its wider setting. Examples of enhancement opportunities include species rich grassland, heather moorland and Cumbrian bank and hedgerow restoration. Such measures contribute to sustainable development. Reference should be made to the Cumbria Landscape Strategy (Cumbria County Council 1998) which identifies enhancement opportunities for each landscape type.

PRESENTATION MATERIAL

In addition to standard text, the following illustrations will assist understanding of the assessment. The requirements respond to problems encountered with the legibility, ease of use and realism of maps and visualisations. To ensure readability of maps and visualisations it is important that they should not be restricted to the standard A3 format commonly used for Environmental Statements, where larger than A3 they should be included in loose leaf format in plastic pockets within the LVIA or in 'fold out' format. Supplementary illustrations in digital format maybe helpful, the format of these should be agreed with the local authority bearing in mind that file sizes are likely to be large. It is also important that any digital images are of high resolution so that visual clarity is not compromised and the colour and tonal quality on photomontages is maintained.

Information Type	Required Format
Proposed Development	
Site Layout	Site Layout Plan Showing position of turbines, services, tracks, all ancillary elements and temporary lay down areas or compounds with site levels in context of physical landscape fabric (including: contours; type and condition of land cover, boundaries and trees; existing access points; existing utilities; public rights of way; and important environmental features) and landscape mitigation measures. Scale 1:2.5,000 – 1:5,000
Turbines and other Elements	Scaled Elevations Showing technical detail of turbines and ancillary buildings with key dimensions. Typical photographs of turbines proposed.
Baseline Conditions:	
Landscape Character and Policy Context	Showing site location, landscape types and sub-types, designations and policies **superimposed on the blade tip ZVI** and OS 50,000 Landranger colour map base within study area. Indicate range bands i.e. 2.4, 6, 12 and 18km related to broad similarities in appearance (see Appendix 1). Reproduction scale: 1:100,000
Immediate Landscape Setting	Showing landscape analysis with radius of 2.4 - 6km (including main landscape characteristics and elements/features influencing modifying visual extent and effects) Scale 1:10,000
Assessment of Effects:	
Extent of Visibility	ZVI for hub height and blade tip on OS 50,000 Landranger colour map base with radius of 18 – 30 km as a composite ZVI combining individual ZVIs for each turbine. Use shading to indicate different numbers of turbines which may be visible. Indicate representative viewpoint locations and range bands i.e. 2.4, 6, 12 and 18km related to broad similarities in appearance (see Appendix 1). Reproduction scale: 1:100,000 Enlarged ZVI to blade tip on OS 50,000 Landranger colour map base within 6km and indicate representative viewpoint locations. Reproduction scale: 1:50,000 Colour and density of ZVI should not obscure OS base information.

Visualisations	Visualisations based on photographs taken with a 50mm lens in a 35mm film format, reproduced at a size for viewing at normal reading distance (approx. 46cm, commonly A3 landscape format giving an image height of approx. 20 cm) and at a viewing angle close to the original field of view of the scene (45 - 130 degrees). On each state location (NGR), elevation, distance to nearest visible turbine, dimensions of all turbines, camera format, lens focal length, horizontal angle of view and appropriate viewing distance. Computer generated wireframe views for all viewpoints (15 – 25 no. with majority within close and mid ranges i.e. 2.4 and 6km). Colour photomontages at all or a selection of viewpoints where significant effects likely as agreed with regulatory authority (5 no. min).
Cumulative Visibility	Cumulative base plan for all built, consented, undetermined applications and relevant schemes in the public domain within a radius of 60km on OS 250k Travelmaster black and white map base plus: national landscape designations, public viewpoints, national trails and cycleways. Indicate the footprint of each development, 30km radius around each in a solid line and 2.4, 6, 12 and 18km range bands in a dashed line. Reproduction scale: 1:150 - 250k (depending on no. of wind energy developments and complexity) Cumulative ZVI to blade tip for all built, consented and undetermined applications within a min radius of 30km of the proposal on OS 1:50,000 Landranger black and white map base. Indicate viewpoint locations representing cumulative effects and 2.4, 6, 12 and 18km range bands. Highlight national landscape designations, public viewpoints, national trails and cycleways. Use colour shading/hatching to distinguish each development and areas from where one or more development is likely to be seen. Reproduction scale: 1:100,000
Cumulative Visualisations	Photomontages and or wireframe views for all viewpoints representing cumulative effects. Within 15km illustrate individual turbines beyond this show as an array. Clearly annotate to interpret the different developments or proposals. Format and information requirements as above plus status of existing developments i.e. installed, consented or decision pending, and distance to nearest visible turbine for each development and dimensions of turbines in each.

REFERENCES

[1] *'Guidelines for Landscape and Visual Impact Assessment'* Second Edition, The Landscape Institute and Institute of Environmental Management and Assessment 2002

[2] *'University of Newcastle: Visual Assessment of Windfarms: Best Practice'* Scottish Natural Heritage 2002

[3] *'Guidelines on the Environmental Impacts of Windfarms and Small Scale Hydroelectric Schemes'* Scottish Natural Heritage February 2001

[4] *'Planning Policy Statement 22: Renewable Energy'* ODPM 2004

[5] *'Guidance: Cumulative Effect of Windfarms'* Scottish Natural Heritage 2005

[6] *'Planning for Renewable Energy: A Companion Guide to PPS 22'* ODPM 2004

[7] *'Wind Farms in Scotland'* Marc van Grieken etal, Landscape Design Journal Oct 2003

[8] *PAN45(revised 2002)*: Renewable Energy Technologies, Scottish Executive

[9] *'Countryside Character Initiative: North West'* Countryside Agency (www.countryside.gov.uk/cci)

[10] *'Cumbria Landscape Classification'* Cumbria County Council, 1995

[11] *'Cumbria and Lake District Joint Structure Plan 2001-2016: Technical Paper 5: Landscape Character'* Cumbria County Council

[12] *'Landscape Character Assessment Guidance for England and Scotland'* Countryside Agency and Scottish Natural Heritage, 2002

[13] *'Landscape Character Assessment: Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity'* Countryside Agency and Scottish Natural Heritage 2003/4

[14] *'Cumbria Landscape Strategy'* Cumbria County Council, 1998

Appendix 1

Guidance on the effects of distance on perception of Wind Energy Developments

From the analysis of guidance and research information (set out below), and experience in Cumbria, the following table presents guidance on the relationship between distance and likely appearance or perception of third generation wind energy developments featuring turbines of approximately 95 – 120m high to blade tip. This guidance assumes an open landscape and should not be used mechanistically as a large number of modifying factors can affect likely appearance. These include different weather conditions, season, time of day, direction of view, the number of turbines and breadth of development relative to the viewer, relationship of wind energy developments to other elements in the view and their compositional qualities, familiarity and expectations of the viewer.

Distance	Likely Appearance	Range
Up to 2.4 kms	Dominant focus, movement of turbines clear and may collectively convey a distinct rhythm	close
2.4 - 6 kms	Prominent, key element of the landscape, turbine details still evident	middle
6 - 12 kms	Conspicuous, noticeable element in wider landscape, only prominent in clear visibility, movement of blades perceptible to casual observer	
12 – 18 kms	Apparent, visible element of a wide landscape, turbines begin to be perceived as a group forming a windfarm rather than individual elements, blade movement only perceptible in clear conditions	long
18 – 30 kms	Inconspicuous, minor element of a wide landscape composition, only seen in very clear visibility, movement of blades generally unclear	

Background Research

PAN 45 (revised 2002): Renewable Energy Technologies, Scottish Executive

The following table is presented in paragraph 78 as a general guide to the effect which distance has on the perception of the development in an open landscape. It is not clear what turbine heights these distances relate to. It was also recognised that perception would also be dependent on whether the turbines can be viewed adjacent to other features, different weather conditions, the character of the development and the landscape and nature of the visibility.

Fig 8: General Perception of a Wind Farm in an Open Landscape

	Perception
Up to 2 kms	Likely to be a prominent feature
2-5 kms	Relatively prominent
5-15 kms	Only prominent in clear visibility – seen as part of the wider landscape
15-30kms	Only seen in very clear visibility – a minor element in the landscape

Guidelines on the Environmental Impacts of Windfarms and Small Scale Hydroelectric Schemes Scottish Natural Heritage February 2001

Broad similarities of visibility extent are described in Section 2.3.3. Again it is recognised that the extent to which a wind farm will be visible will depend on its size and positioning in relation to particular landscape characteristics, especially landform, other vertical features and the clarity of the light and prevailing weather conditions. However, assuming an open landscape their descriptions can be summarised as set out in the table below. The distance bands correspond to those used in PAN 45 and appear to be based on experience of turbines up to a blade tip height of 90m.

	Likely Appearance
Up to 2 km	Dominant focus, movement of turbines clear and may collectively convey a distinct rhythm.
2-5 km	Key element of the landscape.
5-15 km	Part of the wider landscape, only prominent in clear visibility, movement of blades may still be discernible.
15-30km	Minor element of a wide landscape composition, only seen in very clear visibility, movement of blades generally unclear.

University of Newcastle: Visual Assessment of Windfarms: Best Practice
Scottish Natural Heritage 2002

Conclusions based on analysis of eight windfarms operating in Scotland are drawn in Section 5 with a caveat that they are only likely to be applicable to other areas in UK of similar character. The sizes of the windfarms ranged from 9 to 46 turbines and were therefore generally larger than those experienced in Cumbria to date. The turbine heights to blade tip were between 53.5 and 85.5m, typical of second generation machines. It is noted that higher turbines are visible over larger distance and they judge that an increase in height to something approaching 100m to blade tip for third generation wind turbines will result in the distance ranges increasing by around 20% in many cases. They note that at distances much greater than 30km the limit of visibility to the human eye is being approached. The following table summarises their conclusions:

Conclusions based on 2nd generation turbines	**Predictions for 3rd generation turbines (ie 20% increase)**	**General Visibility**
5 - 8 km	6 – 9.6 km	Turbine detail noticeable.
10 - 15 km	12 – 18km	Perceptible to a casual observer, begin to be perceived as a group forming a windfarm rather than individual turbines, blade movement perceptible in clear conditions.
15-25 km	18 – 30km	Perceptible in clear conditions by sensitive observers and residents.

The 20% increase is reflected in their recommendation for a ZVI distance of 30km for turbines of 100m to blade tip.

They state that distance should not be used mechanistically to predict magnitude at a particular viewpoint because it can be modified by a large number of factors, some related to human perception and some related to physical elements and the design of the environment. Consequently a detailed table of six visual size classes rather than distances is provided which has some useful descriptors.