

APPENDIX 8.1:

LANDSCAPE AND VISUAL IMPACT ASSESSMENT OF WIND FARMS METHODOLOGY

Introduction

1. This appendix sets out the approach used for the landscape and visual impact assessment (“LVIA”) and broadly describes the methods employed to determine the likely effects of a wind farm development on landscape and visual amenity, set out in the Scoping Consultation Report. This appendix also presents the methodology and approach used to define the baseline landscape character on which the subsequent assessment of effects is based.
2. Throughout the main body of the text of the LVIA the assessment criteria used to define levels of value, quality, sensitivity to change, magnitude of change and definitions of levels of effects are presented. These criteria are also presented in tabular form in the following appendix. The thresholds of significance of effect are also set out.

Assessment Guidelines

3. The approach used for this LVIA is based on three main source methodologies. Firstly, The Guidelines for Landscape and Visual Impact Assessment published by the Landscape Institute and Institute of Environmental Management and Assessment (Third Edition 2013). Secondly, the Countryside Agency’s Landscape Character Assessment Guidance (1999 revised 2002) and thirdly the CCW (now NRW) (May 2013) LANDMAP Information Guidance Note 3: Using LANDMAP for landscape and visual impact assessment of onshore wind turbines. In addition, the University of Newcastle have published guidelines (Visual Assessment of Windfarms: Best Practice. Report F01AA303A Commissioned by SNH: University of Newcastle (2002)); on the form and content of landscape and visual impact assessments for wind farms which dovetails with the Visual Representation of Windfarms: Good Practice Guidance: SNH / Horner & Maclennan and Envision (2006).
4. These guidelines have been broadly adhered to in all respects other than that they advocate a 35km study area for turbines of 100m or over. Initial zone of visual influence diagrams, confirmed by wire frames, indicated that whilst there may be some views at distances of over 20km, they will not be large elements of the view and over this distance would not bring about any significant effects. It has therefore been felt that for the purposes of this large-scale turbine development in this landscape context, a detailed 20km study area is sufficient.
5. This method of assessment also takes into account general planning advice TAN 8 (2005) and the in the more recently published Planning Policy Wales (2014).
6. The assessment has drawn on information in the relevant adopted Local Plans and Structure Plan as well as the emerging local development frameworks that cover the study area (see references), and on Ordnance Survey Explorer (1:50,000) and Landranger (1:25,000) maps.

Assessment Methodology

7. The assessment has been undertaken in a structured and analytical way, in the following stages:
8. Initially a review of the proposed development was undertaken to determine the elements likely to bring about either direct or indirect effects on the landscape and visual amenity.

Micro-changes to the turbine positions were then designed into the layout to create the most cohesive design within the context of other technical constraints. In addition, mitigating measures to reduce the potential landscape and visual effects, of the ancillary structures in particular, were incorporated. There was detailed consideration over the locations of turbines (as detailed in **Chapter 5**), with the final layout incorporating these turbines at the optimal distance from constraints. Some mitigation measures have also been proposed, principally for ecology within the site boundary.

9. The landscape character assessment and visual assessment are treated as separate studies, each with their own set of criteria. The landscape character assessment is concerned with identifying and assessing the importance to be placed on the landscape characteristics, landscape quality and condition of the landscape. The LANDMAP landscape character assessment was used to inform the baseline character of the study area. An initial assessment of the sensitivity of the landscape and component features to the proposed development was also undertaken, supported by the conclusions within LANDMAP. The visual assessment aims to assess the extent of visibility of a development, define the sensitivity of receptors, and set out the likely perception of viewers and visually sensitive receptors.
10. Secondly a review of the landscape and visual context of the development was undertaken. This involved a broad-scale review of the existing landscape character, and published landscape character assessments within LANDMAP. A review was also undertaken of the landscape designations and main visual receptors in the study area.
11. Thirdly, a visibility analysis to ascertain the locations in the study area from where the proposed wind farm could be visible was conducted. This included a viewpoint analysis to predict the magnitude of change in views that would be likely to occur as the result of the proposed development from a selection of viewpoints. These have been initially selected to represent the main visual receptors in the study area. This selection process, conducted as part of the Scoping Consultation Process, is set out in **Chapter 8** and was discussed in broad terms with the designated landscape architect (Helen Moriarty in Powys in 2004-5 and latterly with Dr Carol Fielding and Simon White). This was also used to inform the assessment of effects on the landscape.
12. A landscape impact assessment, to identify the potentially significant effects of the proposals on the landscape fabric of the site, and on the landscape character of the landscape character areas and landscape designations in the study area, followed in the next stage. This was based on the landscape character assessment baseline and on the outcome of the visibility analysis.
13. Then an assessment of the likely changes in view, to identify the potentially significant effects of the proposals on the visual amenity of the study area, was undertaken broadly for the initial 35km study area and then in much greater detail within the refined 20km study area, starting at the centre of the study area, close to the site, radiating out and identifying where significant effects would be experienced and where these would fall to non-significant effects in individual areas.
14. Conclusions were then drawn based on the assessments, and include a summary of the landscape and visual assessments. Conclusions on the significance of the effects of the development in this locality were finally produced.

15. The process, whilst broadly based on GLVIA3, has evolved from assessments undertaken based more upon the previously published GLVIA guidance. The current approach within GLVIA3 is promoting a more discussive and less “matrix-based” approach, it is expecting a number of stages to be separately assessed. It guides towards assessing landscape quality and value at the baseline stage, then assess susceptibility to change, then combine susceptibility and value to give sensitivity and then combine sensitivity with magnitude to give significance. Following GLVIA2 the assessor previously went straight from key characteristics and value (at the baseline stage) to significance (by way of a discussion and definitions in the assessment of effects on landscape). Following GLVIA3 assessors are having to provide a lot more assessment and discussion than previously. This is in theory producing a more transparent assessment. It is for this reason, transparency of assessment, that the matrix approach has been maintained, so that a reviewer can very easily see how sensitivity of receptor and magnitude of change are combined to determine the magnitude of effect and then sensitivity in a very robust and transparent way.
16. To aid in the thorough assessment of the potential impact of the proposed turbines on the visual amenity of the study area, plans showing the bare ground Zone of Theoretical Visibility (“ZTV”) have been generated based on the topography of the area as recorded by Ordnance Survey. These have been generated to assist in the visibility assessments. ZTVs show the bare-ground extent of visibility to the tip of the turbines. They do not take into consideration the local topography conditions which are not represented on the Ordnance Survey map contours, and take no account of vegetation, hedges, houses or other built or natural structures. They also do not take account of the direction of the viewer or orientation of the fixed-receptor in relation to the proposed wind turbines, and may indicate a theoretical view that is outside of the actual angle of view afforded by the receptor. Places indicated on the ZTV as having potential views are verified using wireframes based on the same digital terrain model. ZTVs have also been used in the cumulative impact assessment to indicate where potential views of one or more wind farms might be experienced.
17. Wireframes are computer generated images based on the contours of the area and provide a realistic indication of the extent of visibility of the turbines from a particular position in the landscape. They use the same base data as the ZTVs. Wireframes have been used by the author in the pre-scoping and design stages, as well as throughout the assessment process as a tool for assessing the likely changes of view anticipated. Wire frames also form the baseline data for the purposes of the assessment of viewpoints. The ratio of wireframes to photomontages was agreed in consultation with the local planning authority. These visualisation tools have been referred to throughout the main body of the LVA text and are presented as figures in the Environmental Statement (“ES”).
18. Photomontages are computer generated photographic images based on the wireframe views showing before and after views. The wind turbines are rendered according to their proposed semi-matt grey colouring, and the lighting conditions captured by the photographer. The turbines are orientated towards the prevailing south westerly wind direction, and are illustrated with randomly arranged rotors to reflect the typical conditions which will be experienced should the proposed Mynydd Y Gwynt Wind Farm be built. Photomontages are produced to provide a representative image of the prospective site, allowing for the screening effects of buildings and vegetation, and are an illustrative tool to enable landscape assessors to demonstrate the potential changes of view anticipated within the environment.

19. Photowires are semi-transparent photographic images overlaid with the computer-generated wireframe views, which are generated using the Ordnance Survey contours of the area. The turbines are orientated towards viewer, regardless of the prevailing wind direction, and are illustrated with vertically aligned rotors to reflect the most prominent view of the turbines which will be experienced should the site be consented. Like photomontages, photowires are produced to provide a representative image of the prospective site, allowing for the screening effects of buildings and vegetation, and are an illustrative tool to enable landscape assessors to demonstrate the potential changes of view anticipated within the environment.
20. The method used for the generation of these visualisation models has been derived by Envision, and conform to the SNH best practice guidance prepared by Horner & McLennan / Envision in 2005 (published 2006).
21. In order that these assessments can be conducted, professional judgments needed to be made on the relative value and quality of either landscape elements or visual receptors. These judgments were made on the basis of factual evidence, reasoned argument and informed opinion. The evaluation of published landscape assessments by CCW (now NRW) assisted in this analytical approach. The thresholds of magnitude of change, receptor sensitivity and significance used in this landscape and visual impact assessments have been set out in tabular form in this appendix. These have been derived from examples and guidance within the Guidelines for Landscape and Visual Impact Assessment published by the Landscape Institute and Institute of Environmental Management and Assessment (1995 revised 2002) and Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity produced by The Countryside Agency (2004).
22. The landscape and visual impact assessment includes a study of the surrounding landscape within which the site is set. All off-site work will be conducted from public highways and public rights of way. Views from private properties were only fully evaluated when permission from the land or house owners was able to be obtained.
23. It must be noted that this particular type of development has the unusual characteristics of a very open form combined with moving elements. Therefore, wind energy schemes cannot be compared directly to other types of development. Some significant effects on landscape and visual amenity as a result of a wind energy development are inevitable, as with any large structure located in a rural location. However, significant effects are not necessarily adverse, and adverse effects are not necessarily unacceptable. The factors determining acceptability, such as the Lavender Test, will be discussed in the Conclusions of the LVIA.

Assessment of Significance of Landscape Effects

24. In order to predict the potential impacts of a development on the landscape and visual amenity an understanding of the existing landscape character, quality, value and sensitivity needs to be assessed. This involved the reviewing of the landscape character assessments at the district level in particular, against which any predicted change can then be measured. The character, quality, scale and value of the landscape will have been assessed using the following criteria, as advocated by the Countryside Agency (now Natural England):
25. Landscape character is defined by the Countryside Agency as being:

“... a distinct and recognizable pattern of elements that occur consistently in a particular type of landscape. Particular combinations of geology, landform, soils, vegetation, land use, field patterns and human settlement create character. Character makes each part of the landscape distinct, and gives each its particular sense of place.”

26. Through the process of landscape characterisation areas of similar characteristics are grouped together into landscape character areas at the regional level and county-level. This process involves an initial desk-study to review published landscape characterisation studies, OS and historical maps and other published information on the area. These initial observations were followed by a thorough study of the landscape, whereby field observations and photographs by the author were used to confirm the decisions made to define landscape character areas in the published landscape character assessments. A recording form was used to record information as objectively as possible. Subjective information on the less tangible characteristics of the landscape was also recorded to inform the impressions or perceptions of the landscape and landscape value.
27. The assessment of landscape quality is based on an interpretation of the distinctiveness, integrity and condition of each landscape character area. The Countryside Agency defines landscape quality as follows:
- “Landscape quality is related to character and is not the same as scenic beauty in the landscape. Quality is primarily a matter of how clearly the distinctive character of a landscape is expressed in an area, and of the state of repair or condition of landscape elements and the integrity and intactness of the landscape.”*
28. Three levels of quality are used in this approach, *high, medium* and *low*. High quality landscapes are those with a strong or distinctive character, in very good condition and very few or no incongruous features. They are the best examples of a particular landscape type. Medium quality landscapes are those that have a moderate strength of character. Whilst retaining many of the key characteristics of the landscape type it may have suffered from some decline and may feature occasional incongruous features. Low quality landscapes are those with weak strength of character, are often fragmented, and/or featuring significant atypical, incongruous, or discordant features.
29. An assessment of the value, or importance of the landscape to society was also undertaken to establish the levels of importance of the potentially affected landscape, and the aspects of the landscape that are valued, to whom and for what reason or purpose.
30. The Countryside Agency defines landscape value as follows:
- “Landscape value refers to the relative value we attach to different landscapes and is the basis for designating or recognising certain highly valued landscapes. A landscape may be valued for many reasons, which might include landscape quality, scenic quality, tranquillity, wilderness value, consensus about its importance either nationally or locally, and other conservation interests and cultural associations”.*
31. Three levels of value are again used through this process, *high, medium* and *low*. High value landscapes are those that are covered by a national designation for landscape value, and display a high number of locally valued features present or are very highly valued as a landscape for other reasons. Medium value landscapes are landscapes not

covered by a local or national designation for landscape value yet with a moderate number of locally valued features present or that are moderately valued as a landscape for other reasons. Low value landscapes are those that are not covered by a local or national designation for landscape with a very few locally valued features present and not locally valued as a landscape for other reasons. They maybe bland or degraded landscapes or landscapes with major incongruous features that have no local associations and very few or no locally valued features.

- 32. For each of the landscape types and sub-character areas from which the proposed development would be potentially visible the key characteristics that determine its character, together with a judgement as to the value of the landscape character, as defined above, and its sensitivity to change will be summarised in the text of the LVIA. Through the term “Landscape Perception” the less tangible aspects of the landscape types are analysed in terms of the overall contribution made to the landscape sensitivity, value, quality and condition.

Landscape Sensitivity

- 33. Landscape sensitivity is defined by the Countryside Agency as:

“Landscape sensitivity is the degree to which a particular landscape character type or area can accommodate change without unacceptable detrimental effects on character. Sensitivity is not absolute but is likely to vary according to the type of change being considered.”

- 34. In this study the sensitivity of the landscape to a particular type of change, the development of a wind farm, has to be considered. Landscape sensitivity is therefore defined, for the purposes of this LVIA study, as:

“The interaction between the landscape itself, the way that it is perceived and the particular nature of the type of change or development in question”.

- 35. Landscape sensitivity is based on the sensitivity of the landscape character and component features, as well as the visual sensitivity of the landscape, to the proposed change. This judgement includes the consideration of the number and nature of the receptors with in the landscape and the scope for the mitigation of impacts to be effective. Landscape sensitivity is assessed through applying the criteria cited in Table 1:

Table 1: Landscape Sensitivity Criteria	
High Sensitivity	Landscape which taking into account its character, general visibility, and potential for mitigation is vulnerable to relatively small changes likely to be brought about through the development of a wind farm.
Medium Sensitivity	Landscape which taking into account its character, general visibility, and potential for mitigation can reasonably accommodate some changes likely to be brought about through the development of a wind farm.
Low Sensitivity	Landscape which taking into account its character, general visibility, and potential for mitigation can accommodate moderate to substantial changes likely to be brought about through the development of a wind farm.

36. The sections headed 'Sensitivity to Change' for each landscape type refer to the sensitivity of the type to the changes likely to be experienced in the views from the zone, area or type. To some extent this is a measure of the value of existing views to the definition of character. However, for the area, zone or type within which the proposed development is to be sited, the 'Sensitivity to Change' will refer to sensitivity to change within the landscape area, zone or type itself as well as views within it.

Magnitude of Change

37. The approach taken in defining the likely magnitude of change of this development on the landscape character or visual amenity is presented in Table 2 below. The change being considered is the addition of turbines, with moving blades to the existing landscape. The LVIA author's observations of turbines in different locations and with different weather and background landscape contexts have informed the broad approach taken, and have been translated into broad criteria for the magnitude of change.

Table 2: Criteria for Magnitude of Landscape Change	
High Magnitude	Notable or high changes in landscape characteristics over a wide area, to very intensive change over a more limited area.
Medium Magnitude	Moderate changes in landscape characteristics in a localised area.
Low Magnitude	Minor change in landscape characteristics
Very Low Magnitude	Very minor change in landscape characteristics
Negligible	Barely perceivable changes in landscape characteristics

Assessment of Significance of Effects on Visual Amenity

38. In assessing the magnitude, and then significance, of visual impacts the GLVIA3 guidelines recommend that the significance of visual effect should be assessed by taking into consideration the sensitivity and importance of the receptor and the nature, scale or magnitude and duration of the change or effect.
39. In the visual analysis the magnitude of change likely to be brought about through the development of a wind farm (with in the order of 20-30 turbines) on this site is defined. The sensitivity of the visual receptors to this change is also assessed. These visual receptors included public rights of way, roads, near dwellings, conservation areas, parklands and public open spaces. The sensitivity of these visual receptors to changes in the landscape is determined in terms of the general visibility and the ability to mitigate changes in visual amenity and effects. Visibility is a function of the combination landform and the presence of vegetation, trees and woodland, with the potential to have a screening effect. The measure of sensitivity also reflects the number of people within the landscape who are likely to perceive the changes, including residents and visitors. The viewpoints selected have been analysed, with the results presented in the main body of the LVIA. In addition, these viewpoints were used through out the landscape and visual impact

assessment as a data set to inform judgements made in the overall assessment process. Table 3 sets out the criteria used in the assessment to judge the sensitivity of visual receptors.

Table 3: Degrees of Sensitivity for Visual Receptors to this type of development	
High Sensitivity	Public views from: Designed vistas or viewpoints Hillforts, Castles and Beacons Settlements or groups of dwellings Public open space Motorways and A class roads National trails or named recreational paths Well used paths Designated Tourist Routes Outdoor recreational and tourism spaces/activities Navigable waterways Private views from residential properties
Medium Sensitivity	Public views from: B class and local distributor roads Main railways Local railways Other public footpaths/bridleways
Low Sensitivity	Public views from: Low usage roads* Little used tracks and paths* Private views from: Commercial properties Industrial properties Agricultural land

* However all Public Rights of Way have been assessed on the basis of assuming the high sensitivity of viewer/user.

40. The magnitude of change likely to be brought about by the development proposals on visual amenity is assessed using the background observations set out in the ‘Visual Assessment of Windfarms: Best Practice’; University of Newcastle for Scottish Natural Heritage; Commissioned Report F01AA303A; 2002, sets out on page 53 that: *“We could detect movement with clarity at distances up to 15 km in clear conditions or conditions of strong contrast between the rotors and the sky, but only if you are specifically looking for the windfarm. On occasions, movement was not visible at 6 km in weak contrast. At a distance of more than about 12 km blade movement can become hardly perceptible and we judge that blade movement is perceptible to the casual observer at up to approximately 10 km. Movement was more perceptible when backdropped against dark vegetation compared to grey sky.”* The turbines proposed on this site are larger in scale than those observed 12 years ago, albeit with slower moving longer blades with a more steady and stable visual image. This observation, along with the LVIA author’s observations have been translated into broad criteria for the magnitude of change in Table 4:

Table 4: Criteria for Magnitude of Visual Amenity Change	
High Magnitude	Notable or high changes of view over an extensive area ranging to very intensive change over a more limited area.
Medium Magnitude	Moderate changes of view in a localised area.
Low Magnitude	Minor change of view.
Very Low	Very minor change of view.
Negligible	Barely perceivable change in view.

Magnitude of Impact

41. By combining the magnitude of change predicted and the sensitivity of the visual amenity, or landscape character, to a particular type of change, an assessment of the magnitude of the impacts can be made. The following Table 5 outlines the general principles that inform this judgment:

Table 5: Degrees of Landscape or Visual Amenity Impact Magnitude					
Impact magnitude ↓					
High	Slight	Moderate	Moderate to Substantial	Substantial	Substantial
Medium	Slight to Negligible	Slight to Moderate	Moderate	Moderate to Substantial	Substantial
Low	Negligible	Slight	Slight to Moderate	Moderate	Moderate to Substantial
Very Low	Negligible	Negligible	Slight to Negligible	Slight	Moderate
Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Receptor Sensitivity →	Very Low	Low	Medium	High	Very High

Significance

42. Through this approach, those effects assessed as being of a moderate to substantial, or greater, magnitude are classified as being significant in Environmental Impact Assessment terms. GLVIA3 recommends that the significance of landscape and visual effects should be assessed by taking into consideration the sensitivity and importance of the receptor and the nature, scale or magnitude and duration of the change or effect. The magnitude of change to the landscape character and/or the visual amenity arising from the proposed

development at any location within the study area is based on the interpretation of a combination of quantifiable parameters, as outlined above.

43 The thresholds of magnitude of change, receptor sensitivity and significance used in this LVIA have been set out in the text within Appendix 8.1 in tabular form. These have been derived from examples and guidance within GLVIA3. The threshold of significance is set in the LVIA and cumulative LVIA (CLVIA) at moderate to substantial. i.e. anything above the median of moderate is significant. In assessing the significance of landscape or visual impacts the GLVIA3 (paragraph 3.22) recommends that practitioners should: “take account of the nature of the effects, as well as the nature of the receptors”. By combining the magnitude of change and the sensitivity of receptor the significance of impact is determined. The same process applies to effects on both landscape and visual amenity receptors. The GLVIA3 also states out that: “*The regulations specify that an EIA must consider direct effects and any indirect, secondary, cumulative, short-, medium- and long-term, permanent and temporary, positive and negative effects of the development.*” This means that in LVIA thought must be given to whether the likely significant landscape and visual effects:

- *result directly from the development itself (direct effects) or from consequential change resulting from the development (indirect and secondary effects), such as alterations to a drainage regime which might change the vegetation downstream with consequences for the landscape, or requirement for associated development, such as a requirement for mineral extraction to supply material or a need to upgrade utilities, both of which may themselves have further landscape and visual effects;*
- *are additional effects caused by the proposed development when considered in conjunction with other proposed developments of the same or different types (cumulative effects);*
- *are likely to be short-term or carry on over a long period of time;*
- *are likely to be permanent or temporary, in which case the duration, as above, is important;*
- *are judged to be positive (beneficial) or negative (adverse) in their consequences for landscape or for views and visual amenity (this is sometimes referred to as the ‘valency’ of the effect but as this word has a formal definition relating to chemistry it is best avoided).*

Data Gathering

43. At the outset of the project baseline information was gathered, including the published landscape character assessments and the local development plans and local development frameworks. A full list of references used in the LVIA is appended to the ES.
44. Information has also been gathered on the extent of national designations within the study area, including the national park to the north of the proposed site. A full list of sources of information to be used in the LVIA is cited in the ES.

Surveys

45. The parts of landscape character assessments undertaken for the authorities covered by the study area that lies within 35km of the proposed development is presented in the main LVIA.
46. A survey of the site itself was initially undertaken, to identify both the elements defining the landscape fabric of the site, and the broader landscape character and nature of visual amenity; views in to and out from the site between 2004 and summer of 2013. This fieldwork was undertaken to form the baseline against which changes likely to be brought about through the proposed wind farm will be judged and impacts assessed.

Method of Cumulative Assessment

47. The methods and guidance used for defining landscape character, quality, value, condition and sensitivity are the same as those used in the LVIA, as set out above in the Assessment Methods. The criteria for the assessment of landscape and visual effects, including the definitions of magnitude of change and receptor sensitivity, as well as the methods for assessing the degrees of landscape and visual amenity impact magnitude, and significance are also the same as those employed in the LVIA.
48. However, despite cumulative impacts on landscape and visual amenity having been assessed following the same methodology, the key factors determining the magnitude of cumulative change include:
 - The number of existing, consented and/or proposed wind farms visible;
 - The distance to each of the existing, consented, and/or proposed wind farms;
 - The direction of each wind farm in relation to the viewpoint, or landscape or visual receptor; and
 - The horizontal angle occupied by each wind farm in relation to the viewer and the other wind farms in the view.
49. This cumulative assessment makes no judgements as to the appropriateness or acceptability of the planned, constructed or consented turbines considered in this cumulative assessment other than the proposed Mynydd y Gwynt Wind Farm turbines.