

6.0 ASSESSMENT OF LANDSCAPE CAPACITY AND CUMULATIVE CHANGE

6.1 Assessment Purpose and Process

The purpose of the following assessment is to determine the capacity of the Aberdeenshire landscape to accommodate wind turbine development and to determine what levels of cumulative development would be acceptable across Aberdeenshire. The assessment involves four stages:

- 1) Firstly assessing the underlying capacity of the Aberdeenshire landscape to accommodate wind turbine development;
- 2) Secondly, assessing the degree of cumulative change resulting from operating and consented wind turbines in the study area and in Aberdeenshire;
- 3) Thirdly, assessing the extent to which cumulative consented development has reached the limit of the landscape's capacity to acceptably accommodate wind energy developments.
- 4) Finally, assessing the level of further development that could acceptably be accommodated within areas of Aberdeenshire.

An assessment methodology is given in **Chapter 2.0** and further detailed in **Appendix 2**. The assessment is summarised in **Table 6.1(a-k)** and **Figures 6.1 to 6.6** following. Table 6.1 is divided into several columns which summarise the assessment and guidance. The assessment works from left to right across the table. A blank table with an explanation of each column/section is shown overleaf.

The map in Figure 6.1a (i-v) shows the underlying capacity for turbines of each size category in each LCA as determined by the assessment in Table 6.1. The assessment gives a broad category of high, medium or low (see method in Chapter 2). Maps in Figure 6.1b (i-v) then show the remaining capacity again in the same broad categories of high, medium or low.

Figures 6.2 and 6.3 are maps showing the extent of existing and proposed wind turbine landscape types in Aberdeenshire. The types are explained in Table 2.1.

- The extents shown in Figure 6.2 are an illustrative approximation based on size and distribution of consented turbines and the modulating effects of topography and landscape character.
- The extents shown in Figure 6.3 illustrate the proposed acceptable extent of future wind turbine development through its effect on the landscape.

The areas shown are approximate, based on landscape character and topography, and account for key constraints and opportunities. In all cases the figures should be interpreted through the further detailed descriptions and guidance given in this report.

The assessment is carried out for each of the Five LCTs in Aberdeenshire and Table 6.1 is then sub-divided into the thirty seven LCA sections (Table 6.1(a-k)). Each table section is

preceded by a brief summary of the landscape character and a map highlighting the distribution of the relevant LCT/ LCAs. The map also shows the distribution of consented and proposed wind turbines (as at Spring 2013) for ease of reference. Each table section where significant capacity has been identified is followed by more detailed illustrated guidance on turbine siting.

This is followed by a summary of capacity and cumulative effects for the whole local authority area, and for the five main regional landscape areas of Aberdeenshire, ie:

- 1) Coastal;
- 2) Coastal Farmland;
- 3) Agricultural Heartlands;
- 4) Moorland;
- 5) Straths and River Valleys.

Further spatial guidance regarding areas with restricted capacity and areas with capacity for further development are given at the end of this chapter and illustrated in **Figure 6.4** and **6.5**.

The capacity assessment and current cumulative change for each of the landscape character types is then combined to come to an assessment of capacity and cumulative effects on the five main regional landscape areas of Aberdeenshire:

6.2 Guidance

Table 6.1 summarises guidance on turbine sizes, group sizes and separation between groups of turbines for each LCT/LCA that would limit cumulative development to the proposed acceptable limit. The details relate to turbines of each size category (small/medium, medium, medium/large, large and very large). It is stressed that the group size and spacing details for an area envisage the capacity for accommodating turbines of a *single size category* in the area, *not* for accommodating all categories together. There may be potential for accommodating different turbine sizes in the same area, but this would depend on the characteristics of the area, and accommodating one size of turbine will affect the ability to accommodate further turbines of any other size.

Where appropriate, further detailed and illustrated guidance for LCT, LCAs and sub-areas is given following the analysis in Table 6.1. The relative positioning and group spacing of turbines is discussed in the detailed guidance for each area.

As highlighted in section 2.3 of this report, guidance on small turbines, below 15m blade tip height, applies at a local level and is generic.

Appendix 5 of this report contains detailed discussion of how turbine size, design, group size and group separation affects perceptions of wind energy and landscape character. Further guidance is given in SNH's *Siting and Designing Windfarms* publication. The

following briefly outlines the main considerations in developing the specific guidance for this assessment given with Table 6.1.

6.2.1 Turbine Size

The guidance on turbine sizes generally relates most clearly to the horizontal and vertical scale of the landscape; complexity of landscape pattern and the presence or absence of smaller scale features and elements such as trees and houses. Smaller size turbines are most able to be accommodated in smaller scale landscapes with more complex patterns and smaller scale reference features. Large and very large turbines (80m+ and 125m+ blade tip respectively) are most successfully accommodated in larger scale landscapes with simpler landforms and fewer small scale references. Smaller turbine sizes may also be accommodated in such landscape types although their proximity to larger size turbines would need to be carefully controlled.

The largest scale upland landscapes in Aberdeenshire are relatively restricted in extent and their value and visibility restrict their capacity. However many of the lowland types are of medium to large scale with a simple landform and pattern and can accommodate larger turbines.

6.2.2 Turbine Group Size

Turbine group sizes relate to scale and complexity of the landscape, particularly to landform and pattern. In general larger scale more simple landscapes with gentle landforms and simpler patterns can accommodate larger groups of turbines, subject to having the physical capacity (ie. available area).

6.2.3 Separation between Turbine Groups

Turbine size and group size can be generically related to landscape character when applied to a single turbine or windfarm, or across a number of windfarms. However, separation between groups of turbines is the single most important factor in controlling cumulative effects. This is because of the high prominence and extensive visibility of most turbines leading to effects on landscape character well beyond the turbine, as discussed in detail in Appendix 5.

The guidance in Table 6.1 therefore gives approximate separation distances that should be applied between turbine groupings (including single turbines) in order to achieve the desired turbine landscape typology. The main factors controlling the proposed separation distance are:

- 1) Proposed Turbine Landscape Type: each proposed type detailed in Table 2.1 requires a different separation distance to achieve the landscape and visual criteria described.
- 2) Turbine Size: larger turbines require a greater separation than smaller turbines to achieve the same landscape type.
- 3) Group Size: larger groups of turbines require a greater separation distance to achieve the same landscape type.

- 4) Landscape Character Type: this has an effect on all the above factors. In terms of visibility, more open landscapes with modest landforms are likely to require greater separation distances, whereas landscapes with significant topography and woodland cover give the potential to reduce visibility. The presence of other tall objects (such as electricity pylons) and of development also affects the perception of turbine development.

The distances given in Table 6.1 are approximate, relating primarily to (1) and (2) above as in this case large groups are not proposed. Landscape character including topography is also important: where landforms are capable of visually separating turbine groups the distance between landforms is a consideration in setting distances.

In the case of small LCAs the separation distances for larger turbines might mean that, in theory, only one grouping would be comfortably accommodated within the area.

Separation distances also apply between a development in one landscape type and another in an adjacent type, or between turbines of different size categories. In such situations an average of the two recommended distances would be most appropriate.

In all cases the distances are an approximate range intended for guidance. Separation distances between specific proposals should therefore be considered in more detail on a case by case basis. In areas where turbine groupings can be accommodated, promote co-ordination between developments in order to accommodate more turbines within the landscape capacity. This includes encouraging turbines of a similar size and clustering as a group in preference to separation.

6.2.4 Other Factors which Influence Guidance

The main areas are identified in Table 6.1 and Figures 6.1 to 6.5 but any specific development should be considered in more detail and assessed against local factors where appropriate.

Finally it is emphasised that this assessment is focused on landscape and visual issues. Areas which have been identified as suitable on this basis may be restricted by other unrelated factors such as protection of wildlife, proximity to dwellings, aviation restrictions or lack of grid connection. These potential constraints are not the subject of this assessment.

Explanation of Table 6.1

LANDSCAPE CHARACTER TYPE: (Classification Code/Number) / NAME OF LANDSCAPE CHARACTER TYPE																		
Key: <input type="radio"/> No Capacity <input type="radio"/> Low Capacity <input type="radio"/> Medium Capacity <input type="radio"/> High Capacity Turbine Size Key: Small/Medium=15-<30m; Medium=30-<50m; Medium/Large=50-<80m; Large=80m+; Very Large=125m+																		
UNDERLYING LANDSCAPE CAPACITY (ie. not taking account of current wind energy development)					CURRENT CONSENTED DEVELOPMENT					PROPOSED LIMITS TO FUTURE DEVELOPMENT (ie. proposed acceptable level of wind energy development)								
Landscape Sensitivity to Wind Energy Development				Landscape Capacity (Related to turbine size)					Existing/ Consented Developments	Current Wind Energy Landscape Type(s)	Future Wind Energy Landscape Type(s)	Remaining Landscape Capacity (Related to turbine size)					Current Applications	Analysis & Guidelines (Refer to Detailed Guidance for Further Information on Siting and Design)
Landscape Character Sensitivity	Visual Sensitivity	Landscape Sensitivity	Landscape Value	S/M	M	M/L	L	VL				S/M	M	M/L	L	VL		
Landscape Character Area: <i>Name of Landscape Character Area</i>																		
Med/High	Med/High	Med/High	Med/High	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Brief description of consented wind energy developments (at time of report), including numbers size range, distribution, with key developments named.	Wind Turbine Landscape Type resulting from current consented levels of development (refer to Table 2.1 for description of type and map in Figure 6.2 for distribution of types across study area)	Proposed limits to future Wind Energy development expressed as a Wind Turbine Landscape Type (refer to Table 2.1 for description of type and Figure 6.3 for proposed distribution of types across the study area)	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Brief description of current applications (at time of report), highlighting the most significant proposals	Landscape Analysis: Brief description of key qualities and characteristics of the landscape character area/ sub-area and its capacity for different types of wind turbine development. Comments on Consented and Proposed Turbines: Brief comment on current developments and future proposals in relation to landscape capacity, using separation distances recommended for turbine sizes with remaining capacity. Further detail is given in the guidance section following the table.
Assessment of landscape sensitivity and value of the landscape character area or sub-area (from detailed assessment in Appendix 5)				Assessment of landscape capacity for different turbine sizes derived from the sensitivity and value assessment and mapped in Figure 6.1a (i-v). This represents the 'underlying' capacity of the landscape and does not take into account the cumulative effects of existing/ consented wind energy development.							Max. Numbers in Group		1-3	1-3				
											Suggested range/ maximum number of turbines in groupings to ensure capacity is not exceeded							
											Min Group Separation Distances (km)		2-4	3-5				
											Suggested separation distance between turbine groupings to ensure capacity is not exceeded							