EUROPEAN BEST PRACTICE GUIDELINES FOR WIND ENERGY DEVELOPMENT

CONTENTS

PREAMBLE

a) Introduction

The European Wind Energy Association was established in 1982 as a professional association for those involved in wind energy research and development. It also acts as the trade association for the wind energy industry. One very important aspect of its work is to promote excellence in wind energy development.

The European Wind Energy Association recognises the importance of ensuring that projects continue to be appropriately sited and sensitively developed. These Best Practice Guidelines, drawn up with the participation of a range of external organisations, aim to facilitate this.

This document explains the steps that should be taken to develop a successful wind turbine generator project. It provides guidelines for activities to be done but does not give step-by-step solutions. Each project is different, and so it is not possible to show in detail how a step should be taken. This document does however give an overview of the various aspects that play a role in the development of wind energy projects. It is important to understand all these issues if a new project is to be successfully completed.

Professional support is of great importance for the successful development of a wind energy project. Part or potentially all the work involved can be contracted out to an engineering company specialised in wind energy.

These guidelines build on the experience gained by the British Wind Energy Association and the Dutch wind energy industry in producing their own Best Practice Guidelines. It also builds on existing literature and on experience gained from wind energy projects already operating in Europe.

The exploitation of renewable energy, including wind energy should be regarded in the context of EU policy on sustainable development.

b) The nature of the guidelines

The guidelines are meant to be practical and are for use primarily by developers. They therefore only cover those issues which are the responsibility of, and can be controlled by, the developer.

Due to the complex nature of wind energy developments, and the requirements for each project to be assessed on its individual merits, it is not practicable to define a checklist of project specifications that can be applied to all developments equally. Therefore the guidelines aim to establish the process and approach for identifying, developing and implementing appropriate wind energy proposals.

These guidelines are very general. They are indicative only, and do not replace existing national energy, environmental and planning policy.

The guidelines primarily cover technical, environmental and planning considerations, and consultation with relevant parties. They cover all scales of wind energy development but apply to different sizes in different ways. Although the principles contained in the guidelines should remain the same for all sizes of development, the work required by a developer in project design and environmental assessment will always depend on the nature, size and location of the proposed project.

The Best Practice Guidelines recognise that some wind energy developments are built as single, "one-off" projects, possibly by a landowner, while others are built by specialist development companies who may be looking to develop a number of sites. The approach adopted by these guidelines is to consider the issues relevant for the development of an individual site, whilst recognising that the site selection process for the developer is likely to entail a process of considering other possible locations.

c) Implementation

The European Wind Energy Association intends that as a result of publishing these guidelines, a developer's approach to an individual project can be assessed by the degree to which that approach follows the spirit and principles set down in the guidelines. The guidelines are voluntary but the European Wind Energy Association invites its members and all responsible developers to take them into consideration in their activities.

The European Wind Energy Association invites local planning authorities* to encourage adherence to the Best Practice Guidelines by recognising that this will foster appropriate and commendable wind energy development.

The guidelines are being widely distributed within the industry and will be made available to other organisations and individuals on request. They will be reviewed periodically to take account of changing circumstances and comments to the European Wind Energy Association on the content of the guidelines are welcome.

d) Structure of these guidelines

The guidelines follow a chronological flow through the development process. They cover three elements of the process:

- **Technical and commercial considerations**

This element considers various technical aspects of the development, including wind speed, accessibility, infrastructure, construction issues and the developer's own analysis of the economic viability of the project.

- **Environmental considerations**

This element relates to the analysis of the effect of the wind energy development on various environmental and amenity interests. This is central to the selection and development of appropriate sites.

The analysis includes:

- the initial site selection phase;
- the detailed assessment in support of a planning application;
- the monitoring of the project in operation; and
- the final site clearance.

As the assessment proceeds the knowledge gained should enable the detailed design of the wind energy project to evolve. The relationship between the assessment of the effects and the design of the wind energy project is iterative so that continual re-evaluation and good consultation is necessary throughout the process.

- **Dialogue and consultation**

This element supports the essential clear dialogue between the developer and all others involved in the project, for example, the local planning authority, the local community, local interest groups and the full range of statutory and non-statutory consultees.

Although they are discussed separately, all three elements are inter-related and they should all be considered as having an important influence on each other.

Terms marked with a star [*] indicate that there is a glossary entry for further explanation of the term.

1. SITE SELECTION

1.1 Introduction

The first phase in any wind generation development is the initial site selection. For many developers the starting point of this process involves looking at a chosen area in order to identify one or more sites which may be suitable for development. Initial analysis should take account of all readily available published environmental and technical data as discussed later in this section. Subsequent phases will require more detailed investigation.

The purpose of this phase is to identify suitable sites and define any technical, commercial or environmental constraints in order that only the most appropriate sites are taken forward. The best practice processes outlined in this initial stage will be necessary for all types of developments to ensure suitable projects are pursued in the most appropriate fashion.

1.2 Technical / Commercial Considerations

1.2.1 Initial technical analysis

The site selection process will largely involve carrying out "desk-based" studies to determine whether sites satisfy crucial technical criteria for successful development, as follows:

- Though at this stage there may only be an approximate estimate of the wind speeds* for a particular site or area, the developer will usually identify sites which offer the potential for a suitable wind resource by using a combination of maps of the area, results of computer modelling, meteorological offices (airports, harbours, farming), or data from university departments dealing with wind energy. It is likely that some studies may have been carried out for the windiest areas. Promising values are average wind speeds above 6 m/s.

- An examination of the local electricity distribution system* and dialogue with the local electricity company will indicate whether an electrical connection to the proposed site is technically and commercially feasible (this only applies to projects which are to be connected to the grid). Information about the electrical grid in the area, map of electric lines and connection possibilities, can be obtained with the electrical company in the area. The electrical company can also give an indication on the likely cost of connecting the wind turbine generators (WTGs) to the electrical grid.

- A study of the local road network will give an idea of the likely access constraints to the proposed site.

- For larger wind energy projects consideration of the likely size of the site will help to establish whether the development will be commercially viable.

- Consideration of site ownership.

• Potential investors. The financial possibilities are determined by the amount of equity put in the project. In this step potential co-investors should also be considered. An idea should also be formed about the appropriate legal body for the operation of the wind turbine generators, for example a limited liability, a co-operative, or a joint-venture with a local energy company. In general the participation of a large number of people, or even a community as a whole, can boost the development of the energy project.

1.3 Initial Environmental Considerations

1.3.1 Initial environmental analysis

At the same time as carrying out technical analyses, developers should also consider the environmental acceptability of potential sites. Many of the initial environmental acceptability considerations will be assisted by studies of existing data.

The European Wind Energy Association recommends that an environmental impact assessment study is conducted.

As well as looking at reports and maps of the area in order to determine specific technical or environmental issues, developers should have regard to existing and emerging national, regional and local planning policies.

The following initial studies should attempt to address at a preliminary level the range of issues, each of which will be scrutinised in greater depth in subsequent phases of the project development:

• **Visual Aspect**
Developers should assess the visibility of the proposed site and the potential visibility of the proposed development from important public viewpoints.

• **Proximity to dwellings**
Wind turbines should not be located so close to domestic dwellings that they unreasonably affect the amenity of such properties through noise, shadow flicker*, visual domination or reflected light*.

• **Ecology**
Developers should take account of existing information relating to both ecological designations which cover a particular area and particular protected species that are found in the area either year round or seasonally.

• **Archaeological / historical heritage**
The existence of listed buildings, Conservation Areas and archaeological sites may have an influence on the acceptability of a particular site.

• **Recreational uses**
Any areas on or close to the site identified in development plans* for recreational use should be considered.

• **Telecommunications***

Microwave, TV, radar or radio transmissions may be affected by the presence of wind turbines. Consideration should be given to situations where this might occur. In most cases, technical problems can readily be resolved.

- **Civil and military airports**

For sites close to airports, the relevant airport authority should be consulted.

- **Restricted areas**

There may be restrictions to the development of WTGs in the proximity of security areas, such as military installations, telecommunications installations, etc.

1.4 Dialogue and Consultation

1.4.1 Initial consultation

Almost all contacts in this phase should be focused on the gathering of information and the distribution of information.

Developers should have initial discussions with the officers of the local planning authority and statutory consultees to identify and agree potential issues which should be addressed. In addition, the developer may consider approaching other consultees such as those suggested by the local planning authority. Good research and consultation at this initial site selection stage should avoid unnecessary time and expense on unsuitable sites.

Whilst proposals remain at a speculative stage it would not be appropriate for developers to start a broad process of local public consultation as this may cause unnecessary concern or excitement about a proposal which may transpire not to be practicable.

2. PROJECT FEASIBILITY

2.1 Introduction

By the beginning of Phase Two, the developer will have identified a site for further examination. This site should be subject to:

- more detailed technical assessment including on-site wind monitoring to determine a draft design and layout for the installation;
- an economic assessment to establish the commercial viability of the project;
- an appraisal and scoping exercise to identify specific environmental constraints and opportunities prior to undertaking, where relevant, the statutory environmental assessment* in Phase Three; and,
- an assessment of planning constraints.

It is during this phase that dialogue with the local community about the project should commence.

2.2 Technical / Commercial Considerations

Whilst Phase One activities are largely desk-based, the focus of technical work during Phase Two will be by visiting and/or surveying the site itself to determine further its suitability and viability. Investigations will be undertaken into:

• Wind Resource

Whilst an approximate estimate of the wind speed over the site can be obtained from databases and computer models, the sensitivity of energy yield* (and hence commercial viability) to wind speed requires a more accurate determination by actual site measurements. These are made using anemometers* supported on a guyed mast at a representative height which may be at the hub height* of a typical wind turbine (about 30-50+ metres). One or more masts may be required and should be in place for not less than 6 months and in some cases longer than 1 year.

Developers should consult with the local planning authority on the requirement for planning permission for anemometry masts and on the extent to which publicity should be given to the erection of such masts. If mast-based anemometry is likely to be required for more than three months, it is appropriate that publicity should be given to the intent to erect anemometry equipment and to the purpose behind this so that the local community is made aware (see point 2.4.2). However, where developers intend to undertake short-term, near-ground wind measurement as part of initial site selection, publicity may well not be appropriate. Many sites are considered in this way and then rejected.

• Existing land uses

The existing uses of the land should be carefully discussed with the landowner, any tenants and all those with rights to occupy the land, to determine whether and how best the wind energy project can integrate with these existing uses. As an example, the importance to the farmer of the location of turbines and access roads will vary between arable land and pasture.

- **Ground conditions**

The ground conditions at the site should be examined to consider whether construction of the foundations for the wind turbines, the erection of the machines and the provision of access roads is practical and economic.

Features which may not appear on maps, such as fences, walls, streams and pipelines will need to be taken into account in the design and layout of the project.

It may be necessary to investigate any previous activity on the potential site that could influence the location of the turbines and their infrastructure (for example: past mining activity under the site).

- **Site access**

The construction of a wind energy project requires access by heavy goods vehicles to the site. Access to the site must be assessed to determine the suitability of existing public and private roads and what improvements may be required to serve the development. The local authority should be consulted. Movement between turbines must also be practical and therefore the route of on-site access tracks should avoid steep gradients.

- **Electrical connection**

The possible routes for, and nature of, the connection to the existing electrical network should be assessed together with the location of the substation*.

The costs for connecting the wind turbine generators to the electrical grid can vary a lot. The distance to the nearest connection point is determining. The local energy company can give information about connection costs.

- **Draft project design**

All of the factors considered to date should be taken into account in determining the scale of the proposed wind energy project. However, at this stage, the developer will only be able to consider a range of design and layout options. This should include potential turbine sizes and numbers.

2.3 Environmental Considerations

2.3.1 Scoping document*

Phase One will have set the background for the environmental issues that will have to be subsequently reviewed. (For some sites, with little or no published data available, it may be necessary to undertake some preliminary survey work in order to identify the environmental sensitivity of the potential site). During Phase Two the developer should agree the scope of the environmental assessment required by the local planning authority which will be undertaken in Phase Three - for more detailed information of which see Section 3.3.

2.4 Dialogue and Consultation

During this phase the developer should open a dialogue with the local community about the project. This dialogue should start as early as possible. However it is important to make clear that at this stage the developer will only have minimal information on the planned project.

When starting detailed discussions with the consultees and local communities on the feasibility of wind energy projects in specific areas, developers should identify the companies involved. The developer should also nominate a representative for regular contact during these preliminary studies and a point of contact with a telephone number and/or address.

2.4.1 Local planning authority

The developer should notify the local planning authority of its intention to study the feasibility of the selected site. It is in the interests of all parties at this stage to communicate freely to avoid unnecessary work.

2.4.2 Local communities

At this stage the developer should work with the local planning authority to consider how the informal public consultation should be conducted and how its results should be taken into account. This consultation should be with non-statutory groups (for example, amenity groups, community organisations, environmental societies, and wildlife trusts) and individuals who may have an interest in the proposed development.

As noted previously, this feasibility phase of the development process requires the installation of one or more anemometer masts to establish whether the study site has sufficient wind for commercial development. These anemometer masts will be subject to local publicity and can give rise to questions of concern or excitement about possible future development.

The developer should at this stage provide general background information on wind energy to the local community.

A variety of methods should be used which aim to get information across effectively to the local community.

It should be accepted that there are a range of options for the proposed wind energy project itself. However, the developer should indicate the anticipated size of the proposed project. This helps to allay unwarranted concerns. The public information

provided should give a clear indication of the future stages of the consultation and development process so that individuals will know what opportunities are available for commenting on issues of concern to them. In addition, the developer must describe the purpose of the wind monitoring masts, the likely period for which they will be needed, the environmental and planning studies to be undertaken for the project, and when the results of such studies are likely to be made available. General background information on existing wind energy projects should help answer many of the early local community questions at this stage.

Comments received from this consultation will give an indication of the breadth of local views. Such local feedback will be useful to the developer in subsequent reappraisals of the project design.

3. DETAILED ASSESSMENT

3.1 Introduction

A developer will implement Phase Three only when the information obtained from Phases One and Two shows that the proposed wind farm may be commercially and environmentally viable. At the beginning of this stage, the developer should have a preferred layout. This layout will evolve throughout the environmental assessment stage.

3.2 Technical / Commercial Considerations

Throughout Phase Three, the developer may continue to gather wind monitoring information and continue to re-appraise the economic viability of the project. The developer should take account of the economic implications of any recommendations arising from this phase.

3.2.1 Selecting the most appropriate wind turbine generator

The wind speed profile will determine the choice for a wind turbine generator, while the supply of wind influences the relative dimensions of the rotor, generator and shaft height. In poor wind conditions then a high shaft height and relative large rotor are necessary.

The develop should obtain offers from a number of wind turbine generator suppliers. These offers must be clearly described. Promises and guarantees are only valid when agreed on paper! One should find out whether the supplier can fulfil the promises and guarantees, by using other sources of information.

3.3 Environmental Considerations

3.3.1 Need for an Environmental Statement

Where the local planning authority believes that the proposed wind farm is likely to have significant effects on the environment by virtue of factors such as its nature, size or location, then it may require the developer to submit an environmental statement.

3.3.2 Topics that could be considered in the environmental statement

- **Site selection**

Following on from Phase One (Site Selection), developers should be prepared to explain why they have selected the particular site under assessment.

- **Visual and landscape assessment**

The existing landscape can be described, and the potential landscape and visual impact of the proposed development assessed and evaluated.

A "Zone of Visual Influence*" could be defined and a map produced which indicates where the proposal may be visible from, within a radius agreed with the local planning authority. This could be used in consultation with the planning authority and relevant consultees to decide important and representative viewpoints from which the visual impact of the proposal can be assessed. These points are likely to include local settlements and important public viewpoints and should include a range of distances from the proposed project and may cross administrative boundaries.

Developers should consider the proximity of the proposed project to already existing wind energy projects and whether it will be possible to see one or more such projects from agreed viewpoints in the surrounding area. The significance of this should be assessed.

The movements of the sun should be taken into consideration. This will allow the developer to assess the movement of the shadow of the turbine in sunny days. When the sun is just above the horizon, the shadows of the wind turbine generators can be very long and could move across a house for a short period of time. The exact position of the shadow can be calculated very accurately for each location.

Dazzling light from the rotor blades can be prevented, by using an anti reflection layer on the rotor blades.

- **Noise assessment**

The advisable distance between residences and a proposed development will depend on a variety of factors including, local topography, the character and level of local background noise and the size of development.

A prediction of the sound produced by the proposed development in the surrounding area should be made and presented in a form agreed with the local authority.

Key dwellings (normally the nearest in each direction) should be identified in consultation with the local authority from where background noise measurements

should be taken. A survey should be undertaken of the character and level of the background noise.

- **Ecological assessment**

The fauna and flora that are found at the proposed site (either year round or seasonally) should be considered in relation to the loss of habitat, to their sensitivity to disturbance and to their importance which may be identified by national and/or local law or policy. It is important that ecological survey work is undertaken at the appropriate time of year to take account of the seasonal nature of some of the potential impacts under consideration.

The developer should meet with the local planning authority and relevant consultees to discuss the timing of construction and amendment of wind turbine positions to avoid important species or habitats. Furthermore, there may be a requirement for on-going monitoring or an overall Environmental Management Plan*, for the construction period or for a defined number of years post-construction, which should be discussed with the local planning authority and with relevant consultees.

A well designed project should not result in loss of valuable habitat or adverse impact on protected species.

- **Archaeological and historical assessment**

Phase One will have identified the existence of any sites of significant archaeological or historical importance within or near to the site. The likelihood of further, as yet undiscovered remains should be considered. The physical impact of the proposal and the effect on the setting should be examined. A well designed wind energy project should avoid physical disturbance to such sites and any impact on the setting should be considered. Mitigating measures should be discussed with the local planning authority and relevant consultees and may be subject to a planning condition or legal agreement.

- **Hydrological assessment**

An assessment of the impact of the proposed development on water courses, their quality and quantity may be necessary. An assessment of spring water supplies should also be undertaken where considered appropriate.

- **Interference with telecommunication systems**

Wind energy projects can cause interference to nearby television and microwave systems. Communication system users should be approached for their views. If a wind energy project is proposed on the route of a microwave or television link then any adverse impact can usually be avoided by re-siting wind turbines or re-routing the link. Similarly if it is considered that local television reception may be affected this can also be avoided through technical solutions.

- **Aircraft safety**

Wind energy projects need to be sited so as not to cause a hazard to aircraft safety through any effects on radar systems or low flying aircraft. The civil and military aircraft authorities must be consulted.

- **Safety assessment**

A safety assessment should be made to include consideration of the structural integrity of the wind turbines intended for use on the site. Other issues which may be considered include, highway safety and shadow flicker.

- **Traffic management and construction**

Details of the construction of the wind energy project should be included. The impacts of construction (including access roads) should be assessed as part of the visual, ecological, hydrological, and archaeological assessments. Any essential road improvements needed to accommodate the development should be discussed and agreed with the local authority.

- **Electrical connection**

In parallel with the wind energy development a power line will normally be installed to the nearest suitable electricity sub-station or other point of connection to the local distribution network. The developer, working with the local public electricity supplier* or other electrical contractor, should ensure that this work is planned following consultation with the local planning authority, the affected landowners and the relevant consultees. Careful account should be taken of the potential impacts on the environment and on land use and appropriate measures should be taken to avoid unnecessary adverse impacts during the installation of the line. Such details of the electrical connection (overhead or underground electricity lines and the substation) as are available at the time should therefore be examined as part of the relevant assessment.

- **Effects on the local economy**

The environmental statement may include an estimate of the number of temporary or permanent jobs created and the value of the contracts available locally.

- **Global environmental effects**

The Environmental Statement should include estimates of the amount of electricity the wind energy project will produce and the quantity of polluting emissions that would be produced from a conventional power station producing the equivalent power. Statistics are available to undertake such calculations and full references should be stated.

- **Tourism and recreational effects**

Public rights of way within the site should be identified and clearly shown on a plan. Visitor facilities, if appropriate should be discussed with the local authority and relevant consultees and any proposed developments should be reviewed in the appropriate assessment. Existing nearby tourist and recreational facilities should be identified. It is important to note that, in many cases, wind energy developments have become tourist attractions.

- **Decommissioning**

The assessment should cover proposed decommissioning* of the wind energy project. Consideration should be given to restoration measures including the removal of above ground equipment, landscaping the foundations and as to whether the remaining roads or tracks on the site will re-seed naturally or will require additional treatment.

3.4 Consultation / Dialogue

The developer should maintain a continuing dialogue with the appropriate statutory and non-statutory consultees and the public throughout the environmental assessment process.

The parties involved can determine jointly where the problems are and how they can be solved. Changes to the original project design should be regularly discussed with the involved parties.

The municipality and the public should be informed on the following matters:

- Wind energy is clean. It does not pollute the atmosphere and is recognised as one of the solutions to the climate change problem.
- Because of the depletion of fossil fuels, like oil, gas and coal, is it necessary to invest in more sustainable energy sources. Wind energy will be an important source of energy in the coming century.
- A wind energy project can have positive results for the local economy.

On the completion of Phase Three the developer will normally be in a position to submit a planning application together with an Environmental Statement.

All parties in the process should be prepared to discuss appropriate revisions to the application in the light of all of the responses received.

The developer should be prepared to explain the way in which comments from the consultation process have been evaluated.

4. PLANNING APPLICATION

4.1 Processing the application

By the beginning of this phase the detailed technical commercial, environmental assessments will have been undertaken. If a site is considered suitable, the developer may submit a planning application to the local planning authority.

The developer should co-operate with the local planning authority in printing and circulating, or making available (for example by lodging in the local public library) sufficient copies of the Environmental Statement (or environmental report where no Environmental Statement is required). This allows the appropriate consultees and the public to inspect and assess the proposed project and to make any formal response to the local planning authority. Public events may be organised by the developer, depending on the level of local interest, to provide a constructive forum for the local community to find out more about the proposed development.

The developer should be prepared to answer any substantive issues in the furtherance of a fully informed decision.

In the case of major applications, a planning committee may wish to visit the site before further consideration at a subsequent meeting.

4.2 Planning conditions and planning obligations

The local planning authority may wish to regulate the construction and operation of the wind energy development by means of planning conditions and/or a planning obligation. Whether conditions or an agreement are appropriate will depend on a variety of factors on which the developer should seek advice. Well drafted conditions or agreements should be discussed by developers and the local planning authority at the earliest possible stage.

Where proposals are acceptable to local planning authorities additional commitments made by the developer to mitigate potential environmental damage help to give confidence both to the local planning authority and local communities that the developer is acting in a responsible manner, and wishes to carry out a development in as sympathetic a manner as possible, deploying the best practicable environmental option.

Depending on the nature, size and location of the wind energy project, the sorts of issues that will normally be considered appropriate for planning conditions or a planning obligation are as follows:-

- Control of noise emissions;
- The regulation of construction access so as to avoid traffic hazards and promote highway safety;
- The decommissioning of the development once electricity ceases to be generated. The local planning authority may wish to be sure that all the surface remains of the development are removed and the site restored to a suitable condition;

- The avoidance of undue interference with electronic transmission systems, including television. The local planning authority may wish to be sure that any interference to transmission systems anticipated by the developer or a consultee is satisfactorily remedied;
- Control of implementation of the development so as to avoid or limit damage to fauna and flora. This form of regulation may often be achieved by well drafted and enforceable Environmental Management Plans;
- Control of the design and colour of wind turbines.

5. CONSTRUCTION

5.1 Introduction

Environmental considerations continue into the construction phase and developers should refer back to the Environmental Statement and conditions and obligations under which planning permission has been granted. Planning conditions should cover any activities during this construction phase where major impacts may occur.

5.2 Technical Considerations.

In view of the number of separate contractors involved in the construction works for a wind energy project, the developer should identify an individual with responsibility for site management to the local planning authority. This individual will have responsibility for all aspects of the work. The developer should also ensure that all contractors are aware of and abide by the requirements of any planning conditions or agreed environmental measures.

5.3 Environmental Considerations

A small percentage of the total project area will be directly affected by the construction activities. Areas of construction work on-site should be delineated in consultation with the local planning authority and measures taken to avoid unnecessary impacts, such as vehicle use, on areas outside the defined working boundary.

If the environmental assessment has identified areas of ecological or archaeological importance then a record of pre-construction site conditions in these areas should be made and they should be considered. This may be a requirement of planning conditions. Such areas should also be notified to the contractors to avoid damage.

Due regard should be given to the safety of those using public rights of way.

The construction work may include the building of temporary or permanent access tracks and storage compounds, turbine foundations and other on-site buildings.

5.4 Dialogue and Consultation

The developer should ensure that on-site and off-site works are undertaken with a minimum of disruption to the local residents.

Wind energy projects will continue to generate interest from the public for some time and the developer should make provision from the start of the works for the handling of enquiries and visitors. Although it is not possible to be prescriptive, the following suggestions may be helpful.

An information board should be displayed in a publicly accessible location at all times giving the name and telephone number of the developer's site representative or other contact.

Consideration should be given to the formation of a community liaison group* providing the opportunity for dialogue between the developer and the local communities.

In the event of any comments or complaints about the construction works, the developer or site representative should be accessible to the local community. Any

complaints should be dealt with quickly and responsibly. Any complainant who is not satisfied with the handling of their complaint by the developer can seek guidance from the local planning authority.

The developer should establish a programme of emergency procedures for 24-hour support to the project works in case of unforeseen problems - for example, problems with vehicles or with vandalism. These procedures should be registered with the local emergency services and with the local planning authority and be noted on the site information board.

6. OPERATION

6.1 Introduction

Developers, owners, and operators of wind energy projects should accept that their responsibility for satisfactory operation of the project carries on throughout its lifetime until it is replaced or removed. Public notice should be given of any changes of operator. There should be no significant environmental problems encountered with the operation of a wind energy project if the developer has sited and designed the project well and has followed these guidelines. However, where appropriate, it should be the responsibility of the owner/operator to monitor the project for any key impacts as agreed with the local planning authority, and to keep local people informed of the results of any such monitoring and the general performance of the wind generation project.

6.2 Environmental Considerations

Potential environmental issues relate to effects on human activities and the site's flora and fauna.

The owner/operator should have a formal procedure for recording and dealing with complaints from the public. The owner/operator should investigate any complaints from individuals and should work with the relevant authorities to address issues raised.

Wildlife disturbance is most likely to become apparent as a result of specific studies carried out by the owner/operator. Normally these studies would be the result of undertakings made by the developers during the planning process, although there may be instances where concerns are raised by individuals after the facility has been built leading to such studies. If it should become apparent that there is a significant ecological impact, the owner/operator should co-operate with the individuals concerned and the relevant statutory and voluntary conservation bodies to determine the nature of the problem and to work towards a solution.

6.3 Dialogue and Consultation

An owner/operator has a responsibility as a member of the community to allow local individuals to raise any concerns they may have about the operation of the project. The owner/operator should have a local representative to whom individuals can voice their concerns. The owner/operator should make themselves, and their representatives, easily accessible to local people within the community through a variety of methods.

In addition to keeping the local community informed about the operation of the wind energy project and any problems which may have occurred, the owner/operator should also work towards disseminating to the wind industry as a whole the results of any studies and the success of any mitigation measures in order that lessons are learnt and acted upon. This can be achieved by contacting national wind energy associations or the European Wind Energy Association. Such information could be circulated through appropriate consultees, environmental / development conferences.

Following commissioning, an owner/operator should operate a good neighbour policy and encourage a greater understanding of wind energy (and specifically their wind energy project) within the local communities.

Public opinion surveys should be conducted early in the project, during operation and regularly thereafter. Surveys have shown that the most opposition occurs before a project begins. Once the public is suitably informed about wind energy, the support grows. Similarly, past experience shows that the support to wind energy from local communities tends to increase after the farm is built. Existing public opinion surveys can be obtained by contacting national wind energy associations or the European Wind Energy Association.

7. DECOMMISSIONING

The subject of decommissioning and site clearance should be adequately covered in the planning conditions and/or planning agreements accompanying permission. However, should the wind energy project cease to produce electricity for a specified period, the owner/operator should remove all the turbines and return the site as closely as practicable to its original state.

Unlike most power generation projects, wind turbines can be decommissioned easily and rapidly. Despite this, developers still need to approach the issue of decommissioning responsibly.

Notice should be given to the local planning authority in advance of commencing decommissioning work.

Normally the scrap value of the turbines themselves will be sufficient to cover the costs of their dismantling. Where this may not be the case, consideration should be given to the setting aside of funds over the life of the project in order to ensure there will be enough money available at the end of the project's life to pay for decommissioning and other reinstatement requirements.

GLOSSARY

Anemometry mast

A mast, on which is fixed equipment (including an anemometer) erected to measure the wind speed and wind direction over a particular site. Anemometry masts are usually slender structures fixed to the ground with guy wires.

Availability

The availability is the quotient between the number of hours that enough wind is available and the number of hours that the wind turbine generator is in actual operation.

Capacity electrical grid

This is the capacity that can be connected to the electrical grid at the point of the location. In some rural areas this capacity can be limited. The costs of expanding the capacity can be high.

Certification

The design and production process of the wind turbine generators are in most cases certified. The norms applied are a result of regulations for safety, damage etc.

Community liaison group

A community liaison group could comprise representatives of the development company (or of the owners and operators as appropriate), planning authority representatives and a cross section of local community representatives. A third party facilitator may be appropriate. The frequency of the meetings and their remit should be agreed by all parties on a basis which is relevant to each site.

dB(A)

The standard for expressing the amount of noise is dB(A) and its comparable to the sensitivity of the human ear:

- 3 dB(A) is the smallest difference one can hear
- 5 dB(A) is a difference which is noted
- 10 dB(A) can be felt as a doubling of the noise

Decommissioning

This is the final phase of a development when the site is cleared of above ground equipment associated with the wind energy project and the land restored to its original use or some other agreed use.

Energy production

The energy production of a wind turbine generator is very sensitive to the local wind speed conditions at the height of the rotor shaft and the Power-Windspeed curve of the wind turbine generator. Here a number of rules-of-the-thumb are given which are applicable for wind energy:

- In case the average wind speed increases by a factor two, then the energy in the wind will increase with a factor eight.
- In case the rotor diameter increases with a factor two, then the energy produced will increase with a factor four.
- Increasing the height of the shaft with one meter will increase mostly the energy production with one per cent.

Energy yield

This is the term to describe the electrical output from a wind energy project. It is strongly influenced by the wind speed (qv) of a site.

Environmental Management Plan

An Environmental Management Plan is a document which crystallises agreed proposals to minimise the environmental impacts of construction activities and working practices. It may specify a method of construction, and it may contain provisions for monitoring environmental effects during operation.

Environmental Assessment / Environmental Statement

Please refer to the EC Directive on Environmental Assessment (85/337/EEC) for projects which may have a significant affect on the environment.

Hub height

This is the height of the wind turbine tower from the ground to the centre-line of the turbine rotor.

Local electricity distribution system

This is the electricity distribution network, normally incorporating overhead poles and wires, but also sometimes underground wires, which connect individual properties and areas to the regional grid at a variety of power levels.

Local public electricity supplier

The local public electricity supplier is responsible for the supply of electricity to individual users.

Megawatts, kilowatts and watts

A megawatt (MW) is equal to 1,000 kilowatts (kW) or 1,000,000 watts (W). It is used as a measurement of electrical generating capacity.

PV-Curve

The P(power)-V(windspeed) curve is a scheme in which the relation between power produced and windspeed is visualised. It can be used to estimate the power delivered to the grid at a certain wind speed. It can be used in combination with a wind speed histogram to calculate the expected yield in a year.

Reflected light

Under certain conditions sunlight may be reflected from wind turbine blades when in motion. The amount of reflected light will depend on the finished surface of the blades and the angle of the sun.

Scoping document

The scoping document establishes the full scope of the environmental assessment and should be agreed in writing with the local planning authority.

Shadow flicker

Under certain combinations of geographical position and time of day, the sun may pass behind the blades of a wind turbine and cast a shadow. When the blades rotate the shadow flicks on and off. The effect only occurs inside buildings where the flicker appears through a window opening. The seasonal duration of this effect can be calculated from geometry of the machine and the latitude of the site.

Shaft height

The height from the ground to the centre of the rotor shaft.

Substation

The electrical substation connects the local electricity network to the electrical system of the wind energy project through a series of automatic safety switches.

Telecommunications (and electromagnetic disturbance)

Telecommunications systems broadcast information at a variety of frequencies and in a number of ways. Telecommunications systems currently in operation over land use microwave, very high frequency (VHF) and ultra high frequency (UHF) systems. Interference with telecommunication systems is known as electromagnetic disturbance or interference, or by the shorthand initials EMI.

Tender

A tender is the assignment for all the works after the procedure of selecting the different bids.

Water interest study

For wind turbines which require substantial foundations, it may be important to establish who obtains water for drinking or agricultural purposes from below ground sources within the relevant catchment area. A water interest study will reveal this information and may help to determine the potential effect of the development on spring water supplies.

Wind speed

The wind speed of a site is a crucial factor in determining the economic viability of a wind energy project. Since energy yield is closely related to wind speed, the higher the wind speed, the greater the energy yield.

Zone of visual influence

A zone of visual influence provides a representation (usually presented as a map with markings or colourings) of the area over which a site and/or a proposed development may be visible.

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