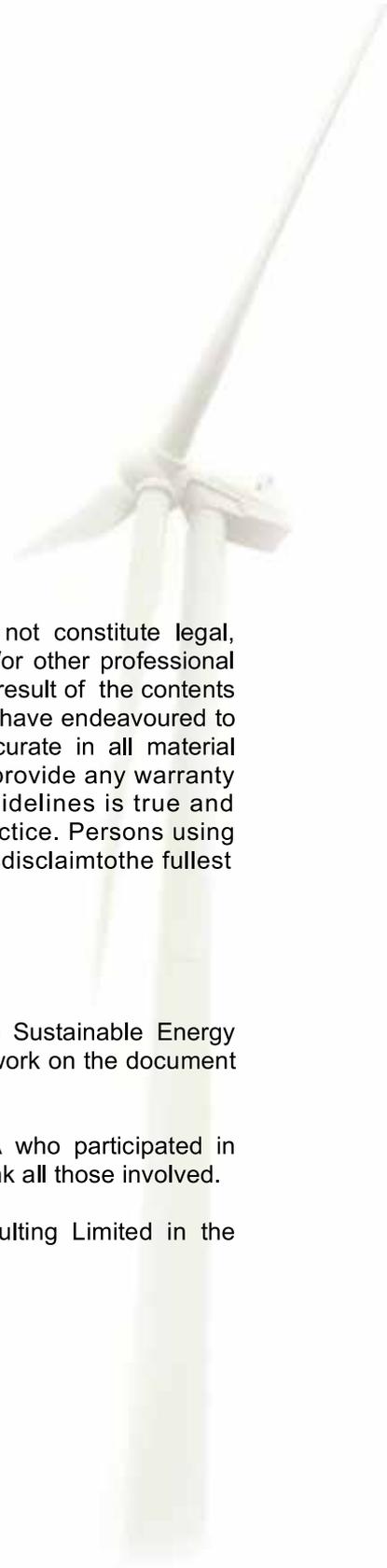




# **Best Practice Guidelines for the Irish Wind Energy Industry**

2008





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These Guidelines are provided for information purposes only and do not constitute legal, business or technical advice. Appropriate legal, business, technical and/or other professional advice should be obtained before taking or refraining from any action as a result of the contents of these Guidelines. While the authors and contributors of the Guidelines have endeavoured to ensure that all information contained in the Guidelines is true and accurate in all material respects at the time of writing, neither the authors nor the contributors provide any warranty (either express or implied) that the information contained in these Guidelines is true and accurate nor that these Guidelines actually represent best industry practice. Persons using these Guidelines do so at their own risk and the authors and contributors disclaim to the fullest extent possible any liability arising from the use of these Guidelines.

## **Acknowledgements**

The IWEA wish to acknowledge the financial assistance received from Sustainable Energy Ireland. We would also like to thank Fehily Timoney & Company for their work on the document and in particular Fionna O'Regan.

The guidelines involved significant input from many members of IWEA who participated in workshops, meetings and telephone conferences and we would like to thank all those involved.

The IWEA would like to recognise the work of Exodea Europe Consulting Limited in the development of the Best Practice Guidelines.

## **Further information**

Irish Wind Energy Association – [www.iwea.com](http://www.iwea.com)

Sustainable Energy Ireland – [www.sei.ie](http://www.sei.ie)



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## SUMMARY

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### Introduction

The IWEA wishes to encourage best practice within the wind energy industry in Ireland. The purpose of these Guidelines is to encourage responsible and sensitive wind farm development.

For smaller developments, procedures outlined in the guidelines can be simplified.

### Guidelines for Feasibility Studies

Matters which can be assessed on a preliminary basis in a feasibility study include the following:

- planning
  - environmental aspects
  - archaeology
  - visual impact
  - wind resource
  - proximity to existing development
  - grid connection access and transportation
  - markets for sale of electricity
  - preliminary legal aspects
  - other existing site information
  - other topics
- consultation with external parties is key to identifying potential future project difficulties
  - a pre-planning meeting with the planning authority can be especially helpful
  - the feasibility study, and particularly the zone of theoretical visibility map, will facilitate the pre-planning meeting

### Wind Monitoring and Analysis

Data from the wind monitoring site is essential for determining the viability of the project and, particularly, for assessing financial viability. A significant effort is required to ensure good data.

The use of a professional monitoring mast installer is recommended.

### Wind Farm Layout

- both site-related and layout-dependant constraints for the wind farm layout design can be considered, where applicable, for the design of the wind farm layout
- issues to be considered in site track design include the utilisation of existing tracks where possible, results of the EIA, and various construction requirements
- the design and location of the sub-station or control house also has particular requirements
- a walkover survey of proposed turbine locations, sub-station or control house location, site tracks and approach roads can be very informative
- Designers need to be mindful of health & safety responsibilities.

## **Environmental Impact Assessment and Planning Permission**

- for the environmental impact statement, developers should refer to relevant Environmental Protection Agency guidance and the Department of the Environment's "Wind Farm Planning Guidelines"
- sub-threshold development will not usually require an environmental impact statement, but the planning authority will need to be satisfied that adequate information has been provided for them to make a decision
- early and in-depth consultation with statutory and other relevant bodies will allow greatest opportunity to provide for any concerns which they may have
- noise assessments can be guided by ISO1996, by "The Assessment and Rating of Noise from Wind Farms" prepared by the Working Group on Noise from Wind Turbines, and published by ETSU for the DTI (1996), and by relevant EPA guidance
- developers should adhere to the recommendations in the Department of the Environment's "Wind Farm Planning Guidelines"
- peat soils could require particular attention with regard to long- and short-term peat slippage risk, hydrology, drainage, and control of erosion, sediment, and nutrients
- telecommunications operators, including RTÉ and the IAA, should be consulted
- good practice in community consultation should be followed for the EIA and planning stage

## **Contracts and Construction – Community and Environmental Aspects**

- landowners should be strongly advised to seek independent legal advice before signing legal documents
- an environmental and a health & safety management system is recommended for construction
- good practice in community liaison should be engaged in for the construction stage

## **Health & Safety**

- it is a developer's duty to be fully aware of legal responsibilities relating to health & safety. Where there is any doubt, professional advice should be sought
- the Health & Safety Authority provides relevant advice
- the approach to health & safety outlined in the BWEA's "Guidelines for Health & Safety in the Wind Energy Industry" (April 2005) is informative, keeping in mind that it is based on UK legislation, and is due to be revised

## **Operation, Maintenance & Decommissioning or Re-powering**

- an environmental, health & safety management plan is recommended for operation
- health & safety in wind farm operation should always be a priority
- good practice in public communications should be engaged in during wind farm operation
- eventual de-commissioning should be planned for

## **Community Consultation**

- good practice in consultation with the local community is recommended at each relevant stage of the project
- approaches to be taken to community consultation will vary, depending on the stage of development of the project

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Raheen Wind Farm. Photo Courtesy of Ecopower Limited

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Raheen Wind Farm. Photo Courtesy of Ecopower Limited

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## 1. INTRODUCTION

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### 1.1. Background

The Irish Wind Energy Association (IWEA) published its “Wind Energy Development Best Practice Guidelines” in 1994. Developments in the industry in the intervening time have now made a revision of the document desirable.

The IWEA wishes to encourage best practice within the industry. It is also anticipated that the new Guidelines will act as a reference document and as a guide to the main issues of which wind energy developers should be aware when developing projects. It is intended that the Guidelines will provide practical guidance and recommendations for anybody developing an onshore wind project in Ireland.

### 1.2. Irish Wind Energy Association

The IWEA was founded in October 1993, with the aim of promoting wind energy development in Ireland. In the interests of the long-term development of the Irish wind energy industry, the IWEA is committed to responsible and sensitive wind energy development.

### 1.3. Development of Irish Wind Energy Industry

The Irish wind energy industry has developed very significantly since the preparation of the IWEA’s Guidelines in 1994. Installed capacity has increased from 16.5 MW at that time to 866MW at (November 2007) - more than a fifty-fold increase. Turbine dimensions were very different at that time. Turbine sizes have increased substantially in the last 10 years and it is anticipated that they will continue to increase in the future.

The first round of the Alternative Energy Requirement (AER) competitive tendering was launched in 1994. At that time, the ESB was the only electricity utility. Since then, Government support has moved to REFIT, the Renewable Energy Feed-In Tariff. A number of electricity utilities are now operating in the market. The electricity market has been liberalised, and a single All-Island electricity market was introduced in November 2007.

### 1.4. Benefits of Wind Energy

The benefits of wind energy have been well recognised in the Government’s recent White Paper on Energy. Substantial targets have been set for 15 % of electricity generation from renewable energy electricity by 2010, and 33 % by 2020. A pivotal contribution is expected from wind energy. The primary drivers for these targets have been recognition of the security of supply, cost, and price stability offered by wind energy, as well as its low impact on the environment.

Wind energy’s significant environmental benefits are now well recognised. A substantial proportion of Ireland’s electricity is soon to be generated from one of the cleanest sources of electricity available. This level of electricity production from wind energy forms a key element of Ireland’s National Climate Change Strategy as well as energy strategy.

## 1.5. Purpose of the Guidelines

The purpose of the Guidelines is to encourage responsible and sensitive wind farm development, which takes into consideration the concerns of local communities, planners, and other interested groups. It outlines the main aspects of wind energy development. Its emphasis is on responsible and sustainable design and environmental practices on aspects of development which affect external stakeholders, and on good community consultation practices.

The Guidelines are aimed primarily at the developer as proponent and project manager of the wind farm development process. However, they will also be of interest to others who have an interest in wind farms. The Guidelines describe the standards which the Irish wind energy industry sets itself in developing wind farms.

The Guidelines discourage insensitive wind farm developments. While it is anticipated that individual circumstances can arise in which it would be unreasonable or over-prescriptive to insist on following certain aspects of the Guidelines, the principle of the Guidelines in encouraging responsible, sustainable wind farm development should still be followed.

The contribution of the Department of the Environment Heritage and Local Government's (DoEHLG's) "Wind Farm Planning Guidelines" (2006) is acknowledged. In approaching the development of Guidelines for the wind industry in Ireland, the aim was to be complementary to DoEHLG's guidance rather than re-stating its subject matter.

The Guidelines can be applied to wind energy developments of all sizes. They are, however, mainly aimed at commercial wind farms. For smaller developments, some procedures outlined in the guidelines could be too onerous, and should be simplified on a common sense basis.



Dundalk IT Wind Turbine. Photo Courtesy of Dundalk IT

\* <http://www.environ.ie/en/Publications/DevelopmentandHousing/Planning/FileDownload,1633,en.pdf>

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## 2. AN OVERVIEW OF WIND ENERGY PROJECT DEVELOPMENT

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The most suitable approach to project development and scheduling will depend on both the individual project and on the individual developer. There is no one project schedule that can be applied to all developments equally.

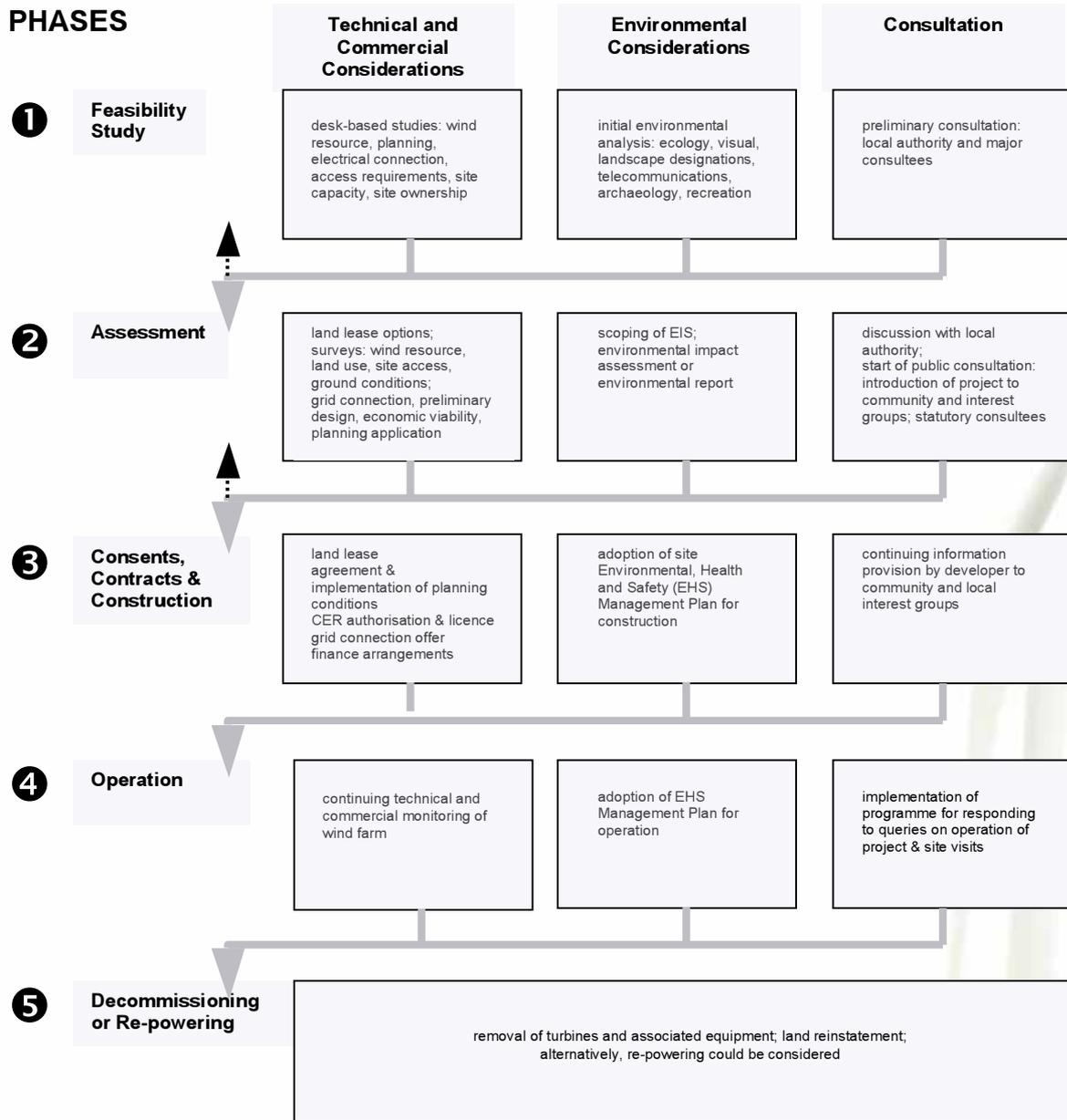
There are five main phases of development which are common to every project, albeit with a varying emphasis and timing of different elements from one project to another.

**Table 2.1: Overview of Wind Energy Project Development**

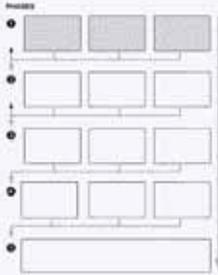
Stage of Development	Elements of Work
1. feasibility	
2. outline design, environmental impact assessment (EIA) and planning	<ul style="list-style-type: none"> <li>a. wind monitoring mast planning permission</li> <li>b. environmental impact assessment</li> <li>c. wind farm layout design</li> <li>d. wind farm planning application</li> </ul>
3. consents, contracts, and construction	<ul style="list-style-type: none"> <li>a. wind energy analysis</li> <li>b. consents               <ul style="list-style-type: none"> <li>o grid connection</li> <li>o Commission for Energy Regulation authorisation and licence</li> <li>o accession to the Trading &amp; Settlement Code</li> </ul> </li> <li>c. contracts               <ul style="list-style-type: none"> <li>o landowner options and leases</li> <li>o wind turbine procurement</li> <li>o power purchase agreement</li> <li>o operations &amp; maintenance agreement</li> <li>o finance</li> <li>o construction</li> </ul> </li> </ul>
4. operation	
5. decommissioning or re-powering	

This document is broadly based on those phases, and examines technical, environmental, and consultation aspects of wind energy development in this context. This is reflected in Figure 2.2 below.

**Figure 2.2: Wind Energy Development Flow Chart**



### 3. GUIDELINES FOR FEASIBILITY STUDIES



The feasibility study is the first phase of development for a potential wind energy project. The feasibility study is a “first-pass” screening approach, testing the main aspects of the development on a preliminary basis.

#### 3.1. Typical Scope of Feasibility Study

Matters which can be examined in the feasibility study are given in Table 3.1 below. Some sources of information for the preparation of feasibility studies are given in Appendix A of this document.

**Table 3.1: Typical Scope of Feasibility Study**

Aspect of Development	Comment
planning	<ul style="list-style-type: none"> <li>County Development Plan (CDP) zoning of site</li> <li>CDP scenic areas and routes, designated views and prospects, amenity zoning, and other relevant zoning</li> <li>CDP policies on wind energy, land use, landscape, and other relevant policies</li> <li>CDP listings of architectural heritage</li> <li>CDP County/local heritage designations</li> <li>Local Area Plans and local area policies</li> <li>planning history of site</li> </ul>
environment	areas designated for environmental protection
archaeology	recorded sites & monuments
visual impact	ZTV map
wind resource	assessment of site elevation, topography of site and surrounding area, land use; SEI wind mapping
proximity to existing development (constructed or permitted)	<ul style="list-style-type: none"> <li>residences</li> <li>neighbouring wind farms</li> <li>forestry</li> <li>telecommunications</li> <li>power lines</li> </ul>
grid connection	preliminary examination of grid connection possibilities
access and transportation	preliminary assessment of transport of over-sized loads to and within the proposed site
markets for sale or use of electricity	outline options currently available: <ul style="list-style-type: none"> <li>power purchase agreement through REFIT</li> <li>power purchase agreement on merchant basis</li> <li>operation in single electricity market</li> <li>auto-production</li> </ul>
preliminary legal aspects	title to the land, rights-of-way, wayleaves, etc.
outline wind turbine layout <sup>†</sup>	based on known constraints, including the form and extent of existing development on the site and in its proximity
other existing site information	e.g., previous geotechnical site investigations or EIAs
other topics	on a case-by-case basis, e.g., flooding, geotechnical risk

<sup>\*</sup> electricity production primarily to serve own consumption needs

<sup>†</sup> this outline layout will facilitate the production of the ZTV, but it is likely to change once more detailed information is available at a later stage

### 3.2. Feasibility Stage Consultation

Consultation is an essential feature of this stage of development. This will include the following:

- major statutory consultees, such as the National Parks and Wildlife Service (NPWS)
- telecommunications operators
- planning authority

The feasibility study, and especially the zone of theoretical visibility (ZTV) map, will provide valuable information for a pre-planning meeting.

### 3.3. Pre-Planning Meeting

A pre-planning meeting can be arranged with the Planning Department of the local authority. This is not obligatory. It can be a good means of assessing the Council's initial views on the proposed development, or any concerns it may have. The pre-planning meeting is also an opportunity to discuss aspects of the proposed scope of the environmental impact statement (EIS), including, for example, potential photomontage viewpoint locations. Where a development will fall below the mandatory threshold requiring an EIS, the possibility of the Council requiring an EIS can be discussed. Where an environmental report is acceptable to the Council for a sub-threshold development, it is of benefit to agree the scope of the report at the pre-planning meeting.

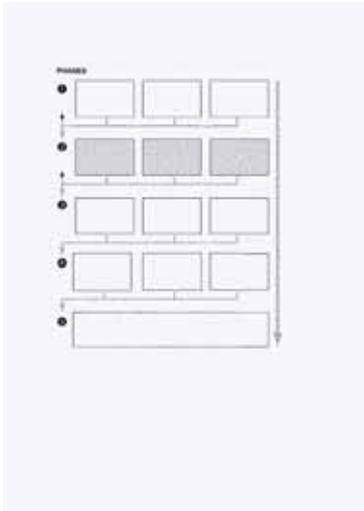
#### Main Best Practice Points - Feasibility Studies

- consultation with external parties is key to identifying potential future project difficulties
- a pre-planning meeting with the planning authority can be especially helpful
- the feasibility study, and particularly the ZTV, will facilitate the pre-planning meeting

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## 4. WIND MONITORING AND ANALYSIS

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A wind monitoring mast will be required for most wind farm sites in Ireland.

### 4.1. Data Quality

Data from the wind monitoring site is essential for determining the viability of the project and, particularly, for assessing financial viability. Problems with the quality of wind data can lead to significant difficulties in obtaining financing. The importance of paying attention to this cannot be over-stated. It is hard to over-emphasise how easy it is to acquire bad data. A significant effort is required to ensure good data.

### 4.2. Mast Installation Best Practice

The primary concerns in mast installation are:

- health and safety
- compliance with planning conditions
- correct installation for good monitoring practices, including installation of instruments
- good records of the installation

The use of a professional installer is recommended.

#### Further Information on Wind Monitoring

1. International Energy Agency Expert Group “Study on Recommended Practices for Wind Turbine Testing and Evaluation – Annex XI: Wind Speed Measurement and Use of Cup Anemometry” 1<sup>st</sup> Edition (1999)<sup>\*</sup>
2. International Electrotechnical Committee 6-1400 Wind turbines - Part 12-1: “Power Performance Measurements of Electricity Producing Wind Turbines” (2005)<sup>†</sup>
3. National Renewable Energy Laboratory “Wind Resource Assessment Handbook – Fundamentals for Conducting a Successful Monitoring Program” (1997)<sup>‡</sup>
4. American Wind Energy Association, “Recommended Practice for the Siting of Wind Energy Conversions Systems” (1993)<sup>§</sup>
5. American Wind Energy Association, “Standard Procedures for Meteorological Measurements at a Potential Wind Turbine Site” (1986)<sup>§</sup>

Some of these publications are a little out of date, but still contain valuable information.

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<sup>\*</sup> available at [http://www.ieawind.org/Task\\_11/RecommendedPract/11%20Anemometry\\_secondPrint.pdf](http://www.ieawind.org/Task_11/RecommendedPract/11%20Anemometry_secondPrint.pdf)

<sup>†</sup> available at <http://webstore.iec.ch/webstore/webstore.nsf/artnum/035360>

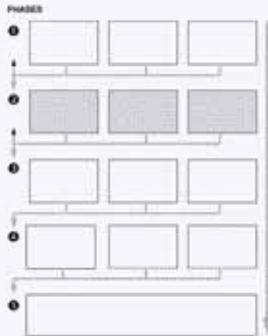
<sup>‡</sup> available at <http://www.nrel.gov/docs/legosti/fy97/22223.pdf>

<sup>§</sup> discontinued, but still available from the American Wind Energy Association; contact details at [www.awea.org](http://www.awea.org)

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## 5. WIND FARM LAYOUT

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The wind farm layout will be required for the application for planning permission. It will include the location and outline design of:

- wind turbines
- site tracks
- site entrance(s)
- permanent meteorological mast(s)
- control house or sub-station

The make and model of wind turbine cannot usually be specified at this stage. This is a matter which is normally subject to change until a wind turbine supply contract is signed.

The development of a preliminary design for a wind farm is typically an iterative approach, in conjunction with an interactive EIA process, and wind modelling and analysis where required.

### 5.1. Turbine Layout

The constraints identified during the EIA process will need to be applied to the process of turbine layout design. This will include the identification of any areas on the site where wind turbines cannot be suitably located. Examples of the site-related design constraints are given in Table 5.1 overleaf.

The local authority could also have additional requirements in the County Development Plan, which will need to be met; The wind energy policy of the specific local authority and other relevant policies will need to be consulted in this regard.

This process will typically result in a “wind turbine search area”. This identifies areas where turbines can be located, subject to review of impacts on other aspects of the environment. These additional constraints can be examined once an initial turbine layout has been identified. Examples of layout-dependent design constraints are outlined in Table 5.2.

Thereafter, a wind model of the proposed wind farm can be very useful in finalising the last stages of the wind farm layout design. It is a commercial decision for the developer to carry out this work at this stage. It can include, for example:

- optimisation of the turbine layout for power production purposes
- reduction of wake effects
- assessment of impact of forestry
- assessment of potential turbulence effects on long-term turbine performance

The turbine layout will probably require some level of approval by the wind turbine manufacturer if a turbine warranty is to be issued, and this will need to be borne in mind.

**Table 5.1: Wind Turbine Layout– Examples of Site-Related Design Constraints**

<b>Constraint</b>	<b>Purpose of Constraint</b>	<b>Typical Application*</b>
neighbouring property	separation distance to avoid a variety of impacts, e.g., blade overhang	as per current DoEHLG Guidelines, where this is reasonable (e.g., this might not always be readily attainable for small landholdings)
neighbouring wind energy development	where a neighbour is also committed to wind energy development, or has planning permission, or has installed wind turbines; significant wake effects on a neighbouring wind development should be avoided	Where significant commitment has been made to developing a neighbouring wind farm <sup>†</sup> , it is considered best practice to allow a <i>minimum</i> of two rotor diameters' distance between the intervening boundary and proposed turbines. For an existing or permitted neighbouring development, a <i>minimum</i> distance of four rotor diameters should be allowed to the neighbouring turbines; analysis of wake effects can be of benefit in this instance.
electricity lines or other sensitive development	separation distance for safety of sensitive infrastructure	seek the advice of ESB or electrical consultant; typically 1.3 to 1.5 times total turbine height but can vary
roads, railway and other similar infrastructure	separation distance for operational purposes, generally	confirm with the National Roads Authority, Iarnród Éireann, etc., and with the local authority; typical requirement – no blade overhang
airports and radar stations	maintenance of operational safety	stringent requirements depending on location; consult with the Irish Aviation Authority
archaeology	separation distance for physical protection; some monuments could require a separation distance with regard to archaeological landscape	on the advice of an archaeologist; often 20 m for physical protection; visual aspects could require longer distances, on the archaeologist's advice
forestry	possible separation distance to existing forestry depending on proximity, extent, level of forestry development, and direction relative to the prevailing wind direction(s)	this is a commercial decision for the developer, and can usefully be informed by the results of modelling
ecology	site specific, e.g., areas of sensitive ecology potentially affected by wind turbines	on the advice of an ecologist and on consultation with NPWS and the County Heritage Officer
soils and geology	ensure health & safety requirements are met; will be site specific but could include, say, avoidance of high risk areas for peat slippage	on the advice of an experienced geotechnical engineer, geologist, or other similar professional
hydrology and hydrogeology	site specific	on the advice of a hydrologist or hydrogeologist and/or an ecologist
topography/slope	site specific	meet construction requirements

\* The local authority could have additional requirements in its County Development Plan or wind energy policy, which will need to be met.

<sup>†</sup> e.g., has applied for planning permission for wind turbines, or is engaged in the EIA process, etc.

**Table 5.2: Wind Turbine Layout – Examples of Layout - Dependent Design Constraints**

Constraint	Purpose of Constraint	Typical Application*
distance to other turbines within the wind farm	avoid wake effects	this is a commercial decision for the developer and can ideally be informed by a wake analysis - usually a <i>minimum</i> of 4 rotor diameters; this can be reduced for very small developments, depending on the orientation of the turbines with respect to the prevailing wind direction; may require larger distances in some instances, depending on acceptability of wake effects obtained from wind analysis
telecommunications	avoid existing line-of-sight signal pathways, etc.; avoid significant impact on airports and radar	based on consultation with telecommunications operators, RTÉ, and the Irish Aviation Authority
visual impact, including potential visual impact on cultural heritage	have regard to potential for significant visual impact at sensitive viewpoints	advice of a landscape architect can be of assistance; consultation with local authority is important (e.g., at pre-planning meeting)
distance to dwellings <sup>†</sup>	meet noise protection guidelines	Noise monitoring and modelling: end result compliant with standards can vary very significantly depending on the number and proximity of a house relative to turbines; it will depend on the turbine chosen and its sound power level; any additional local authority noise requirements will need to be met. Where the local authority will allow, limits can be significantly relaxed for dwellings associated with the proposed development. <sup>‡</sup>

#### 5.1.1. Turbine Buildability Survey

Topographical and other features not evident from mapping could affect the suitability of proposed turbine locations, so a walkover survey of the final turbine layout can be of benefit. This can include an assessment of the proposed sub-station or control house location.

#### 5.1.2. Records of Design and Mitigation Processes

\* The local authority could have additional requirements in its County Development Plan or wind energy policy, which will need to be met.

† Fixed distances to housing are generally considered inappropriate, and limits should relate instead to noise and other environmental criteria.

‡ This is because noise and shadow flicker impacts of wind turbines on dwellings are in most cases a matter relating to nuisance rather than health. In such cases, letters of consent from the relevant householders should be submitted in support of the planning application, stating that they are aware of predicted environmental impacts on their dwellings, as outlined in the EIS, and that this is acceptable to them. This approach will be accepted by many local authorities.

The processes outlined above can be recorded and outlined in the “Alternatives” section of the EIS. In particular, where turbine layouts have been modified as a result of the processes described above, maps of each layout can be retained and included in an appendix to the EIS.

A considerable level of work will typically be carried out to design a layout that attempts to avoid and mitigate environmental impact. It will be of benefit if this effort is clearly illustrated to the planning authority and in the EIS.

## **5.2. Site Track Layout**

The choice of location of site entrance(s) and wind turbine location can dictate many aspects of the site track layout. However, a number of factors will need to be considered in finalising the layout:

- it will normally be beneficial to use existing site tracks where possible, minimising the development of new site tracks
- note should be taken of areas to be avoided for ecological, archaeological, or other reasons
- where possible, tracks should follow land contours, once other environmental and engineering requirements are met
- the maximum gradient suitable for construction should be borne in mind
- bends and turning circles will need to be checked against the requirements of the largest vehicles using them
- allowance needs to be made at bends for trailers swinging out over the edge of the road – the turning radius for the trailer body could be larger than that of the wheel base, and this is especially important when dealing with slopes; additional excavation may need to be provided for
- geotechnical, ecological, and archaeological advice will be required; on occasion, some areas may need to be avoided completely
- the suitability of drainage measures to be provided will need to be confirmed; detailed drainage design is generally not required at this stage; however, in some sensitive soils, additional information may need to be provided

### 5.2.1. Site Track Buildability Survey

It is of benefit to have a walkover survey of the proposed site tracks carried out by a suitably experienced engineer. This work can include:

- site confirmation of suitability of slopes, local topographical features, stream crossings, etc.
- identification of structures such as bridges and culverts, which could be affected by construction traffic, both within the site, and in the local road network on the approaches to the site; an initial assessment of the suitability of these structures will be required, and any necessary strengthening or remedial work briefly outlined

Informal consultation with the Roads Department of the local authority can provide practical information at this stage.

## **5.3. Control House or Substation**

The requirements of Eirgrid and of the turbine manufacturer will need to be provided for in the outline design which is prepared for planning purposes.

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\* some turbine manufacturers provide a transport manual which provides this information

A poorly-sited substation can act as an obstacle, and where the site layout permits, will ideally be located away from turbines, and not in the prevailing wind direction. It will typically be located at the extremities of the wind farm. It is also usual for the location to be in the general direction of the proposed grid connection point, if known. This is partly because the grid connection will usually run overground from this point to avoid overhead lines within the wind farm.

It should be understood that the operational requirements of the sub-station are critical in the choice of its location.

The location of the sub-station will, where possible, also need to be chosen according to criteria established from field surveys, as outlined in Section 5.1 of this document, for example, sensitive areas for ecology, archaeology, or geotechnical conditions, might need to be avoided. Visual impact may need to be considered. Planning authorities may not favour sub-stations on hill ridges, for example. Keeping the sub-station near field boundaries is often preferred by planning authorities, if this is possible or suitable. If desired, mitigation measures such as the use of earth berms or vegetation can be implemented for visual screening. Section 6.11.(1) and (2) of DoEHLG's Wind Farm Planning Guidelines can also be consulted on this matter. We note that palisade fencing around the compound could be required for safety purposes.

The safety, health, and welfare requirements of operatives working in the sub-station from time to time will need to be provided for in its design.

#### **5.4. Ancillary Development**

If there are existing entrances to the site, it will usually be preferred if these are used where possible. They may need some modification. It will also be of benefit to discuss this with the local authority roads engineer.

At least one permanent meteorological mast is likely to be required in most cases, and should be sited appropriately.

#### **5.5. Health & Safety in Design**

Designers will need to be mindful of their health & safety responsibilities, as outlined in Section 8 of this document. Guidance on risk assessment for wind farm layouts is given in Section 7.4 of the British Wind Energy Association's "Guidelines for Health & Safety in the Wind Energy Industry" (2005).\*

##### **Main Best Practice Points - Wind Farm Layout Design**

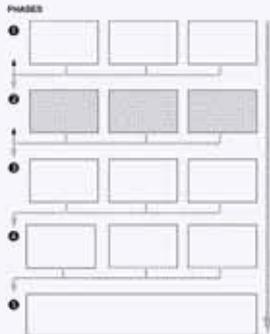
- site-related and layout-dependant constraints for the wind farm layout design are outlined in Table 5.1 and Table 5.2; these can be considered where applicable
- topographical and other features not evident from mapping could affect the suitability of proposed turbine locations; a walkover survey of the final turbine layout can be of benefit
- the main issues to be considered in site track design are outlined in Section 5.2 above
- similarly, a walkover survey of the proposed site tracks and approach roads can be usefully carried out by a suitably experienced engineer
- guidance on sub-station or control house design is given in Section 5.3 above and the DoEHLG Wind Farm Planning Guidelines
- Designers need to be mindful of health & safety responsibilities (Section 5.5 above)

\* <http://www.bwea.com/pdf/HSGuidelines.pdf>

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## 6. ENVIRONMENTAL IMPACT ASSESSMENT AND PLANNING PERMISSION

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### 6.1. Wind Monitoring Mast Planning Permission

Once a suitable wind monitoring mast location has been identified, a planning application can be made to the local authority. Permission should be applied for a period of at least three years.

### 6.2. Environmental Impact Assessment of Wind Farm

In preparing an EIS, reference should be made to the following EPA documents:

- “Guidelines on the Information to be Contained in EIS” (2002)\*
- “Advice Notes on Current Practice in the Preparation of EIS” (2003)\*
- DoEHLG “Wind Farm Planning Guidelines” (2006)

Before commencing the assessment a check should be made to establish if any amendments or updates have been issued.

#### 6.2.1. Requirement for an Environmental Impact Statement

An EIS is mandatory for any development with more than 5 turbines or having a total output greater than 5 MW.

#### 6.2.2. Sub-EIA Threshold Development

For developments under this mandatory limit, local authorities are required to request an EIA if, in their view, the proposed development has the potential to have significant environmental impacts, or could have an impact on a Special Area of Conservation, Natural Heritage Area, or Special Protection Area, etc. Reference can be made to the DoEHLG’s “Environmental Impact Assessment (EIA) Guidance for Consent Authorities regarding Sub-threshold Development” (2003).\*

Sub-threshold developments will typically be for only one to two turbines. Auto-producers, for example at industrial sites, could fall under this category.

In practice, an EIS is not often required for sub-threshold wind farm developments. Where an EIS is not required, an environmental report will normally need to be prepared to support the planning application. This will need to cover the main items of information which the local authority will require. It is important to agree with the local authority at a pre-planning meeting what the scope of work should be.

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\* These documents are available at <http://www.epa.ie/downloads/advice/ea/guidelines>

### *Scoping of Environmental Report for Sub-Threshold Development*

Scoping should be focused on issues and impacts which are:

1. environmentally based
2. likely to occur
3. significant and adverse

Typically, the following information will be needed:

- ZTV
- photomontages – the number will depend on circumstances; three might normally be acceptable for these small developments; this will depend on whether there are scenic areas, or routes, nearby, and on the preferences of the planning authority
- habitat survey – the results of the survey will outline whether further work is necessary; a detailed ecology survey might not normally be necessary on agricultural land, for example; however, one might be necessary if protected habitats are present; NPWS will also provide advice on the presence of protected species
- the following information is also relevant in determining the level of any additional ecology or archaeology work which could be required:
  - proximity of areas designated for environmental protection
  - proximity of recorded sites and monuments
  - potential drainage into sensitive catchments
- noise modelling for dwellings within 500m of a turbine
- shadow flicker modelling for buildings within ten rotor diameters of a turbine
- telecommunications
- assessment of peat stability, if relevant
- outline of anticipated traffic, and traffic routes
- other pertinent, site specific factors

The format of the environmental report will typically follow that of an EIS, i.e., description of proposed development, description of receiving environment, description of potential impacts, proposed mitigation measures, and outline of residual impacts.

### *Consultation for Sub-Threshold Development*

The level of consultation required with statutory bodies, telecommunications operators, and the local community is similar to that required for an EIS, as outlined in section 6.2.4 of this document.

#### 6.2.3. Scoping of Environmental Impact Assessment

The “Scoping” section of the EPA’s EIS Guidelines document contains important information on this aspect of the EIA process. The EIA scoping requires experienced, competent judgement, and consultation with relevant parties.

The feasibility study for the wind farm will have highlighted significant environmental sensitivities associated with the proposed development. This information will be relevant to the scoping exercise for the EIA.

It is important that the level of information required for the EIA is proportionate to the sensitivity of the site and to the scale of development. The legislation governing the EIA process requires information on “significant” impacts. Trivial impacts do not need to be covered.

#### 6.2.4. EIA Consultation

Consultation with relevant bodies is especially important in EIA scoping. It will need to be carried out at the very earliest stage, as some of these bodies can take some time to respond. The information received as a result can be very valuable and will very much guide the work to be carried out for the EIA. However, the initial consultation with these parties at the feasibility study stage ought to have identified most significant or sensitive issues in advance. A list of the main consultees is given in Appendix C of this document.

In particular, the following are important to contact:

- County Council planners (pre-planning meeting), roads department, Heritage Officer
- Development Applications Unit (DAU) of the DoEHLG
- NPWS, and National Monuments and Architectural Division of DoEHLG
- local NPWS ranger, and the regional ecologist - a site visit should be arranged if possible
- regional fisheries board
- EIA procedures require that the public be consulted; this is elaborated on in Section 6.4 of this document

Other parties to be consulted are outlined in the following EPA documents:

- Guidelines on the information to be contained in EIS (2002)
- Advice Notes on Current Practice in the preparation of EIS (2003)

### **6.3. Main Aspects of EIS – Supplementary Notes**

EIA requirements have increased significantly in recent years. Detailed references to technical EIA requirements have not been given here. It is considered that, in the context of rapidly changing and increasing standards, the relevant specialists will be best positioned to advise on this matter at the relevant point in time.

The main topics examined during the EIA process, and discussed in the EIS, are well described in the DoEHLG's Wind Farm Planning Guidelines. Therefore, this IWEA document does not examine these topics in detail; however, some supplementary comments are given below. The supplementary topics include:

- description of proposed development
- human beings
  - noise
  - shadow flicker
  - tourism
  - health & safety
- natural heritage
- soils and geology
- multi-disciplinary team for sensitive soils
- cultural heritage
- land use and material assets
  - telecommunications systems

#### 6.3.1. Description of Proposed Development

The detailed description of the proposed development is very important. It should outline construction, operation, decommissioning, and any phasing envisaged for the project.

Associated development, including construction and any relevant off-site development, will need to be described in full. While these aspects of developments may not require planning permission, or, where they could be subject to a separate application for planning permission, they will still require to be described for EIA purposes. This could include:

- construction-related activities, including borrow-pits and quarries
- road widening and improvement works on the approaches to the site
- the grid connection
- waste disposal locations, including spoil from excavation
- replacement afforestation, where this is relevant
- cumulative development

Due to circumstances often outside the control of the developer, not all information required on these matters might be available. In this case, any available information should be included, together with an explanation in the EIS of the limitations which prevent fuller information being presented. The description of the grid connection is a pertinent example, which is regularly encountered. In such cases, the level of information on the grid connection that might be desired by the planning authority is often not available, whether from Eirgrid, or from any other party. Section 4.3 of the DoEHLG's Wind Farm Planning Guidelines acknowledges the difficulties encountered in such situations.

### 6.3.2. Impacts on Human Beings

#### *Noise*

The DoEHLG Guidelines on noise limits should be followed. Any additional requirements outlined by local authorities in their County Development Plans or formally adopted wind energy policies will need to be met. The following documents also provide guidance on the assessment of noise:

- "The Assessment and Rating of Noise from Wind Farms" ETSU-R-97 (1996), prepared by the Working Group on Noise from Wind Turbines on behalf of ETSU for the UK DTI
- ISO 1996 "Description, Measurement and Assessment of Environmental Noise"
- EPA "Environmental Noise Survey Guidance Document" (2003)\*

#### *Shadow Flicker*

'Wind Turbines, like other tall structures, can cast long shadows when the sun is low in the sky. The effect known as 'shadow flicker' occurs where the blades of a wind turbine cast a shadow over a window in a nearby house and the rotation of the blades causes the shadow to flick on and off. This effect lasts only for a short period and happens only in certain specific combines circumstances such as when:

- the sun is shining and is at a low angle (after dawn and before sunset): **and**
- the turbine is directly between the sun and the affected property; **and**
- there is enough wind energy to ensure that the turbine blades are moving. †

Calculations for shadow flicker modelling generally assume 100 % sunshine conditions. It is reasonable in Ireland's climate to modify these figures. Some attention can also be given to the wind rose. If winds rarely come from the sectors which would give rise to the greatest shadow flicker effects on a dwelling, this can be taken into account.

Where shadow flicker is anticipated to lead to potential problems, measures can be implemented to mitigate these effects. Wind turbine control software is available, which can turn the relevant turbine off at these times. The developer may wish to consider the economic impact of use of this mechanism. Other mitigation measures could include the provision of screening measures, where this is acceptable to the relevant householder.

\* <http://www.epa.ie/downloads/advice/licensee/env%20noise%20survey.pdf>

† Department of the Environment, Heritage and Local Government 'Wind Farm Planning Guidelines' pg. 33.

The assessment of potentially sensitive locations or receptors within a distance of ten rotor diameters from proposed turbine locations will normally be suitable for EIA purposes. A guideline of not more than 30 hours of shadow flicker per year is suggested for dwellings.

### *Tourism*

Walking routes, beaches, and other attractions from which the development will be visible should be considered.

### *Health & Safety*

Health and safety issues for wind farm construction, operation, and decommissioning, as identified in the relevant preliminary design risk assessments, can be outlined in this section of the EIS.

### 6.3.3. Impacts on Natural Heritage

The scope and content of ecology surveys are continually evolving. This is particularly the case for bird surveys, for example. Occasionally, sites could now require several different types of bird surveys, each with different monitoring requirements and methodologies, depending on the bird species present (e.g., standard breeding bird survey, standard wintering bird survey, water birds, hen harrier, red grouse). Guidance on this matter will be provided by the NPWS.

Fish surveys, which require a licence, could be required in certain sensitive locations, where the development is draining into salmonid waters, and where there might be some risk of sediment or nutrient release. This should be discussed with the relevant regional Fisheries Board.

Should any complex matters arise on which NPWS, County Heritage Officer, or Regional Fisheries Board have some concerns, it can be of benefit to consult with the relevant party again when the appropriate section of the EIS is nearing completion. This helps to assess whether the requirements of statutory consultees are met in advance of lodging the planning application.

### 6.3.4. Impacts on Soils and Geology

The Institute of Geologists of Ireland have produced “Geology in Environmental Impact Statements – A Guide” (2002).<sup>\*</sup> It has recommendations with regard to the soils and geology section of the EIS.

Local authorities will often require the assessment of soils and geology to be carried out by an experienced geotechnical engineer, geologist, or other similar professional. This is important in areas of high peat slippage risk or other sensitive soils. This is further outlined below. In most instances this level of work will be required for sensitive soils only, and will not normally be necessary.

### *Impacts on Peat Soils*

There are significant differences between the characteristics of mineral soils and those of peat soils. Most geotechnical investigation techniques have been developed to consider mineral

<sup>\*</sup> available at [http://www.igi.ie/docs/Geology\\_in\\_EIS-A\\_Guide.rtf](http://www.igi.ie/docs/Geology_in_EIS-A_Guide.rtf)

soils. These approaches are often insufficient for the assessment of peat soils. It is therefore important that the engineering or geology specialist engaged for this section of the EIA has good experience in and a thorough understanding of the dynamics of peat.

An introduction to the assessment of development in peat soils is given in Section 5.3 and Appendix 4 of the DoEHLG Wind Farm Planning Guidelines. Its recommendations should be followed where relevant.

A good assessment of geotechnical considerations at the EIA stage is given in a document prepared by the Scottish Executive: "Peat Landslide Hazard and Risk Assessments - Best Practice Guide for Proposed Electricity Generation Developments" (2006).<sup>\*</sup> This document provides guidance for the geotechnical specialist when scoping the work required for the EIA. This scoping should be agreed in conjunction with a hydrologist or hydrogeologist, and the ecologist, as outlined in the section on the "Multi-Disciplinary Team" below. The approach chosen should meet the requirements of all team members.

The long-term risks of construction on peat stability will also require assessment. These risks will include the effects of de-watering and oxidisation of cuttings and exposed embankments, which could lead to the degradation of under-lying peat, destabilisation, and long-term slippage risk. The choice of construction methodologies could have a significant effect on these risks.

#### 6.3.5. Multi-Disciplinary Team

Geotechnical requirements for development in peat soils can have a significant effect on site hydrology, hydrogeology, or ecology. Thus, the recommendations of the geotechnical specialist will need to be made in conjunction with those of a hydrologist and an ecologist, or similar professionals. This will include, for example, the choice of approach for construction, including mitigation measures being considered.

Thus, assessments of peat landslide hazard and risk typically require a competent, multidisciplinary team, to cover geotechnical, hydrological, and ecological requirements. Based on Scottish Executive recommendations, it is likely to comprise the following (or equivalent):

- (i) engineering geologist or geotechnical engineer
- (ii) engineering hydrologist, hydrogeologist, or environmental geologist
- (iii) ecologist and/or bog vegetation specialist

These team members will need to have demonstrable experience in managing geotechnical risk and undertaking upland geohazard assessments and/or surveys, specifically in peatland environments. They should be appropriately qualified for this work. Matters specific to peat soils, which could be considered by the multi-disciplinary team, are outlined in Table 6.1 below.

**Table 6.1: EIA Assessment in Peat Soils**

Design Aspects to be Examined	Potential Impacts to be Examined
<ul style="list-style-type: none"> <li>• location of turbines</li> <li>• location of site tracks</li> <li>• choice of construction methods</li> <li>• approach to drainage design</li> <li>• peat disposal measures</li> </ul>	<p>both construction-related and long-term impacts will need to be considered for the following:</p> <ul style="list-style-type: none"> <li>• health &amp; safety, and slope stability</li> <li>• effects on surrounding bogland of de-watering in cuttings, and oxidisation of peat</li> <li>• sediment and erosion control</li> <li>• nutrient control</li> <li>• impact of site track and drainage design on soils, hydrology, and ecology, including fisheries where</li> </ul>

\* available at <http://www.scotland.gov.uk/Resource/Doc/161862/0043972.pdf>

	<p>relevant</p> <ul style="list-style-type: none"> <li>• environmental impact of peat disposal measures</li> <li>• re-vegetation measures</li> </ul>
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In most instances the level of detail provided here would normally only be appropriate for the design stage of a wind farm, and would not generally be required for an EIS; however, in dealing with sensitive soils in sensitive locations, a greater level of detail could be necessary. Consultation with NPWS and the Regional Fisheries Board will have highlighted this.

#### 6.3.6. Impacts on Cultural Heritage

An archaeologist will normally carry out a field survey, and prepare an archaeological impact report. Other aspects of cultural heritage should also be assessed in the EIS, including architecture, and places of spiritual, traditional, or local importance.

#### 6.3.7. Impacts on Land Use and Material Assets

The impact of the proposed wind farm on land use in the vicinity should be described in the EIS, including forestry and mineral resources. Impacts on infrastructure in the vicinity should be outlined, including road, rail, electricity grid, and telecommunications networks.

#### *Impacts on Telecommunications Systems*

##### Identification and Mitigation of Effects on Telecommunications Signals

Each of the main telecommunications operators will need to be contacted. They will need the proposed wind turbine co-ordinates to perform their assessments. Where telecommunications operators have masts in the vicinity of the proposed wind farm, enquiries should be made about other parties who could be utilising the mast for private telecommunications networks. This can include companies such as the ESB, or veterinary practices.

Telecommunications signals can occasionally be affected by wind turbines. This is outlined below. A list of telecommunications operators is given in Appendix B of this document. This list should not be regarded as definitive. Contact details will need to be checked, as the telecommunications market is subject to change.

##### Point-to-Point Signals

Where line-of-sight signals are concerned, it is possible to identify potential negative impacts in advance, and design the wind turbine locations to avoid their paths. The telecommunications operators are best able to advise on this.

##### Point-to-Multipoint Signals

UHF- and VHF-type signals such as the radio and television services operated by RTÉ can occasionally be affected by turbines at some sites. Mitigation measures can generally be provided in this respect. This might include supplying dwellings with more directional-style aerials; sometimes relay or booster signals might need to be provided, in conjunction with RTÉ.

It is RTÉ's usual practice to require a Protocol to be signed which, effectively, requires the developer to accept total financial responsibility for remedial measures which could be required as a result of potential negative impact of the wind farm on RTÉ's network. A copy of the report prepared by RTÉ outlining the potential impact of the wind farm should be requested. This is

necessary for the developer to understand the degree of potential risk being undertaken in signing the Protocol.

Airtricity have developed software which they have offered to make available to the industry, to assist in the assessment of impact on television services.\* These difficulties may arise less frequently in the future, with the increasing use of satellite television and cable networks.

#### Irish Aviation Authority

Consultation with the Irish Aviation Authority is particularly important with respect to airports, RADAR, and vehicle guidance systems. Sustainable Energy Ireland published a study: "Investigation of the Impact of Wind Turbines on Radar" (2004), which provides relevant information.†

#### 6.3.8. Scope of EIA Field Surveys

Where practicable, it is often considered effective to have EIA field surveys cover the full area of the landholding where there is a legitimate anticipation that turbines could be located. It is often more expensive to go back and re-survey additional ground if turbines are moved afterwards; also, the time of year may no longer be appropriate. A common sense view should be taken on very large sites. It is desirable – from a practical point of view - that field surveys inform the layout design process and not the other way around. Otherwise the turbine layout might have to be re-designed once better information on the site becomes available.

#### 6.4. **Community Consultation for Environmental Impact Assessment and Planning**

An appropriate approach to community consultation is important, both during early project development stages, and during the environmental impact assessment process. These matters are addressed in Chapter 10 of this document.

#### 6.5. **Wind Farm Planning Permission**

The following matters relating to the application for planning permission for a wind farm are briefly outlined in Appendix D of this document:

- pre-planning meeting
- submission of planning application
- further information requests
- strategic infrastructure
- planning appeals

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\* available from Airtricity, Airtricity House, Ravenscourt Office Park, Sandyford, D18; (01) 6556 400; [www.airtricity.com](http://www.airtricity.com)

† available at <http://www.sei.ie/uploadedfiles/FundedProgrammes/ImpactofWindTurbinesRadarStudyFinal.pdf>

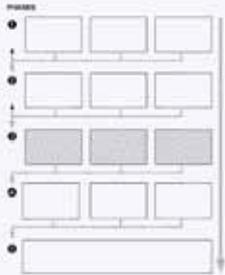
## Main Best Practice Points - Environmental Impact Assessment and Planning

- for an EIS, developers should refer to the following:
  - Guidelines on the Information to be Contained in EIS (2002)
  - Advice Notes on Current Practice in the preparation of EIS (2003)
  - DoEHLG Wind Farm Planning Guidelines (2006)
- sub-threshold development will not normally require an EIS, but the local authority will need to be satisfied that adequate information has been provided for them to make a decision on the planning application; typical requirements for information are outlined in Section 6.2.1 of this document
- early and in-depth consultation with statutory and other relevant bodies will allow greatest opportunity to provide for any concerns which they may have, which ought to assist the planning process; detailed negotiation and agreement could be required in some instances
- for the EIS, description of the proposed development should be thorough, and include construction impacts, indirect impacts, and cumulative impacts
- noise assessments can be guided by ISO1996, by “The Assessment and Rating of Noise from Wind Farms” prepared by the Working Group on Noise from Wind Turbines, and published by ETSU for the DTI (1996), and by relevant EPA guidance
- developers should adhere to noise recommendations laid out in the DoEHLG “Wind Farm Planning Guidelines”
- guidance can be taken from the recommendations of the Institute of Geologists of Ireland document, “Geology in Environmental Impact Statements – A Guide” (2002)
- where peat or other sensitive soils are present, a multi-disciplinary team should be established for the relevant sections of the EIA, covering geotechnical, hydrological, and ecological impacts
- the recommendations for peat soils in the DoEHLG “Wind Farm Planning Guidelines” (Section 5.3 and Appendix 4) should be followed where relevant
- peat soils could require particular attention with regard to long- and short-term peat slippage risk, hydrology, drainage, and control of erosion, sediment, and nutrients
- the Scottish Executive document “Peat Landslide Hazard and Risk Assessments - Best Practice Guide for Proposed Electricity Generation Developments” (2006) can be used to aid scoping of the EIA, together with hydrology/hydrogeology and ecology requirements
- telecommunications operators, including RTÉ and the IAA, should be consulted once turbine co-ordinates are available
- community consultation should broadly follow the approach proposed in Section 6.4 above
- when submitting a planning application, prior consultation with the local authority on the application can assist in avoiding invalidation
- developers can apply for a longer period of planning validity; reference can be made to the DoEHLG “Wind Farm Planning Guidelines,” which outlines this possibility

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## 7. CONTRACTS AND CONSTRUCTION – COMMUNITY AND ENVIRONMENTAL ASPECTS

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The following aspects of contracts and construction are outlined below:

- landowner leases
- management of construction environmental, health and safety issues
- community consultation

Other matters pertinent to contracts and construction of wind farms are outlined in Appendix E of this document.

### 7.1. Landowner Agreements

Every landowner should be advised to seek independent legal advice before signing any legal documents.

An option to lease land is first typically entered into, followed by the lease itself. Sometimes a separate agreement is drawn up for the wind monitoring mast, as it can take time to agree the full leasing arrangements. Wayleaves and rights-of-way may need to be negotiated separately in some circumstances, e.g., to provide access to the wind farm.

Where more than one landowner is involved, it is advised that, where possible, developers adopt a consistent approach to arrangements and communication strategies.

Landowner negotiations will need to be entered into as early as possible in a project. These processes can be very time-consuming, and can contribute to delays. Similarly, sufficient time must be allowed for landowners to consider legal documentation. Where no legal advice has been obtained by the landowner, agreements should allow for a cooling-off period; two weeks is suggested.

#### 7.1.1. Agreement for Monitoring Mast

An agreement with a landowner for a wind monitoring mast should at a minimum incorporate the following:

- mast location and total area required
- duration of monitoring period
- liability
- access to land
- insurance
- title to data and equipment
- third party rights (grazing, for example)

#### 7.1.2. Lease for Wind Farm

The number of turbines to be constructed on any individual site should ideally be determined by EIA processes and impartial wind farm layout design. It can be unhelpful to agree these matters in advance of either of these stages, or before planning permission has been granted and a thorough wind data analysis carried out. This is because the layout often needs to be changed

as a result of these processes. Leases and options to lease that remain flexible on this matter are recommended.

A sample UK Wind Lease was drawn up under an ETSU contract and in consultation with the BWEA, Country Land Owners Association, and National Farmers Union. It is based on UK law and not fully applicable in the Irish context; however, the main topics are considered.\*

A Declaration of Identity will normally be required by the lending institution, and this work will need to be carried out by a Chartered Engineer. This confirms that the turbines are located within the landholding intended, according to the lease.

### 7.1.3. Wayleaves and Rights-of-Way

Wayleaves and rights-of-way could be required by the developer where:

- access to the wind farm site is required from public roads and is not available through the wind farm landholding
- the developer chooses to negotiate a route for the grid connection, in the anticipation that it will be acceptable to Eirgrid or ESB Networks
- a contestable grid connection is sought

The advice of a solicitor experienced in landowner negotiations will be important.

Where relevant, Eirgrid or ESB Networks may need to approve the route chosen. Where underground cabling is proposed along the public road, the local authority will be required to approve the route, as road opening licences are likely to be required, as well as road closure licences during construction. The local authority could require a traffic management plan in these instances.

The negotiation of wayleaves should allow for assignment to Eirgrid or ESB Networks as appropriate, who may also need to approve the wording of the wayleave. Access to the wayleave is also an issue of interest for each party to the contract. Points or routes of access to the wayleave should be specified. These should reasonably take into account the needs of each party.

## **7.2. Contract for Wind Farm Construction –Environmental, Health & Safety Aspects**

It is recommended that the construction contract require the contractor to specify and operate an Environmental, Health & Safety Management system. The local authority can also be consulted on this matter. Among other things, the EHS management system could consider:

- legal, permit, and compliance issues
- control of the extent of the works
- erosion and sediment control
- dust and construction noise management
- vegetation management and rehabilitation requirements
- weed control
- water run-off, including storm water
- storage of hazardous materials
- waste management
- reporting of accidents, incidents and "near events" to the Client
- use of and reinstatement of borrow pits
- excavation procedures
- surface water monitoring
- construction traffic management plan
- fauna management (including any requirements for monitoring)
- handling of complaints
- reporting
- works permit requirements
- emergency and incident management
- fire hazard management
- audit and inspection programme
- any other relevant, site-specific requirements

\* available at <http://www.reic.co.uk/genlease.doc>

### 7.3. Community Consultation during the Construction Phase

Consultation with the local community will continue to be important during the construction phase of a project. This is outlined in Chapter 10 of this document.

### 7.4. Other Aspects of Contracts and Construction

The following aspects of contracts and construction for wind farms are outlined in Appendix E of this document, as follows:

- grid connection contract
- company structure
- wind turbine supply contract
- sale of electricity
- wind farm construction contract
- contract with owner's engineer
- operations and maintenance contract
- finance
- other permits and authorisations
- miscellaneous items during the construction stage

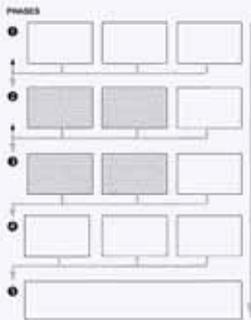
#### **Main Best Practice Points – Contracts and Construction – Community and Environmental Aspects**

- every landowner should be advised to seek independent legal advice before signing any legal documents, whether relating to option agreements, leases, wayleaves, or rights-of-way
- an environmental, health & safety management plan is recommended for construction
- community liaison should be carried out as outlined in Section 7.3 above

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## 8. HEALTH & SAFETY

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A developer has legal obligations with regard to health and safety. These obligations apply to the design, construction, and operation of the wind farm. This section of the document concentrates on a developer's legal design and construction responsibilities.

The British Wind Energy Association has published the, "Guidelines for Health & Safety in the Wind Energy Industry" (April 2005). This is based on UK legislation, but does have many similarities to Irish legislation. This document is due to be revised.

Advice on Health & Safety responsibilities should be sought from a competent professional, e.g., health & safety specialist or Engineer.

Supplementary information on health & safety in construction is provided in Appendix F of this document.

### 8.1. Client's Duties for Design and Construction

In health & safety terms, the developer is known as the client. A client is a person (including a company) for whom construction work is being carried out for the purpose of a trade or business or other undertaking.

The client is legally obliged to carry out the following duties for every construction project:

- **before design work starts**, appoint in writing a Project Supervisor Design Process (PSDP) who has adequate training, knowledge, experience, and resources
- **before construction begins**, appoint in writing a Project Supervisor Construction Stage (PSCS) who has adequate training, knowledge, experience, and resources
- obtain written confirmation of acceptance of each of these appointments
- be satisfied that each designer and contractor appointed has adequate training, knowledge, experience, and resources for the work to be carried out
- co-operate with the project supervisors and supply necessary information
- retain and make available the Safety File for the completed structure; the Safety File contains information necessary for future maintenance or renovation
- provide a copy of the Safety & Health Plan prepared by the PSDP to every person tendering for the project; this Plan documents how health & safety on the project will be managed up to project completion
- notify the Health & Safety Authority of the appointment of the PSDP where construction is likely to take more than 500 person days or 30 working days

The understanding of what constitutes design and construction work is important in identifying the point at which these procedures are to be implemented.

**Design** means the preparation of drawings, particulars, specifications, calculations and bills-of-quantities, where they contain specifications, or other expressions of purpose, according to which a project, or any part or component of a project, is to be executed.

The definition of **construction work** is wide and includes building work and any associated preparation, cleaning and maintenance, or the commissioning, maintenance and repair of energy systems. A fuller definition is given in Appendix F of this document.

#### 8.1.1. Notes on the Client's Health & Safety Responsibilities for Design and Construction

In addition to the duties outlined in Section 8.1 above, the client should be aware of the following:

1. geotechnical site investigations may require a PSDP and PSCS to be appointed, where excavations or drilling are to take place (excluding surveys); this should be checked
2. a client can appoint himself as the PSDP or PSCS if he has adequate training, knowledge, experience, and resources
3. if competent and resourced to do so, it is often the lead designer who undertakes the role of PSDP
4. if competent and resourced to do so, it is often the contractor who undertakes the role of PSCS
5. for a design & build projects, it will normally be the lead contractor who undertakes the duties of both PSDP and PSCS; a health & safety co-ordinator for the design process will then normally be appointed from within the contractor's team; normally the lead designer accepts this role
6. the duties outlined above are sometimes also performed by specialist health & safety organisations, especially on particularly large or complex projects

#### **8.2. Duties of a Designer**

The developer will often act as a designer, particularly in early project stages (see definition of design work as given in Section 8.1 above). The duties of designers are outlined in brief as follows:

- identify any hazards that the design could present during construction and subsequent maintenance
- where possible, eliminate the hazards or reduce the risk, e.g., can roof-mounted equipment be placed at ground level, or can guard-rails be provided to protect workers from falling?
- communicate necessary control measures, design assumptions or remaining risks to the PSDP so they can be dealt with in the Safety and Health Plan
- co-operate with other designers and the PSDP or PSCS
- take account of any existing safety and health plan or safety file
- comply with directions issued by the PSDP or PSCS
- where no PSDP has been appointed, inform the client that a PSDP must be appointed
- the Safety Health and Welfare at Work Act 2005 requires Designers to ensure that the project is capable of being constructed safely, can be operated and maintained safely, and complies with all relevant health and safety legislation

A more thorough examination of the duties of designers is given in the "Guidelines on the Procurement, Design and Management Requirements of the Safety Health and Welfare at Work (Construction) Regulations 2006", published by the Health & Safety Authority (HSA).\*

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\* available from the HSA at <http://publications.hsa.ie/index.asp?locID=6&docID=200>

### 8.3. Client's Duties During Operation of a Wind Farm

This advice relates specifically to construction-related health & safety legislation; general health & safety legislation for a workplace also applies.

Project supervisors may need to be appointed to cover routine maintenance work such as cleaning, decorating, and repair where any of the following apply:

- the work involves a particular risk
- there is more than one contractor
- the work will last more than 30 days or 500 person days

This also applies to the decommissioning (or re-powering) of a wind farm.

#### Main Best Practice Points – Health & Safety

- it is a developer's duty to be fully aware of legal responsibilities relating to health & safety; where there is any doubt, professional advice should be sought
- the Health & Safety Authority provides relevant advice
- the approach to health & safety outlined in the BWEA's "Guidelines for Health & Safety in the Wind Energy Industry" (April 2005) is informative, bearing in mind that it is based on UK legislation, and is due to be revised

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## 9. OPERATION, MAINTENANCE & DECOMMISSIONING OR RE-POWERING

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Ongoing operations at a wind farm will include:

- its operation and maintenance
- possible environmental monitoring and reporting requirements, depending on the conditions of planning permission - these may need to be managed by the wind farm operator
- ongoing screening and monitoring of operational performance
- financial reporting requirements to lending institutions

Annual operations and maintenance costs include:

- servicing and spare parts
- rates
- land rent
- insurance
- power charges
- monitoring and administration
- others

Technical consultancy services are available for standard checks before the end of a guarantee period.

It is in the developer's interest to pay close attention to the wind farm performance during the operational period. Monthly performance can be analysed, and compared to similar monthly periods for previous years. Performance can be analysed relative to expected performance as indicated by the data from the wind mast on-site. Trends and patterns of behaviours can be noted, as well as departures from those trends. These checks can be set up to run automatically using information from the SCADA system. This process is carried out on a turbine-by-turbine basis, as well as for the wind farm as a whole.

An annual review of wind farm performance is a useful exercise. An example is given in Appendix C of the European Wind Energy Association's "Wind Energy – The Facts" (2004).\*

Notes on wind farm insurance are provided in Appendix G of this document.

An environmental, health & safety management plan is recommended for the operation of the wind farm. This can also incorporate eventual decommissioning or re-powering.

### 9.1. Operational Health & Safety

Health & Safety in wind farm operation should always be a priority. The Health & Safety Authority provides information on relevant legislation, Guidelines, and Codes of Practice. The BWEA's "Guidelines for Health & Safety in the Wind Energy Industry" (2005) is informative. Well developed Safety and Method Statements are essential.

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\* available at <http://www.ewea.org/index.php?id=91>

## 9.2. Public Communications During Wind Farm Operation

Communications with the public, including the local community, will continue to be important during the operation of the wind farm. This is outlined in Chapter 10 of this document.

## 9.3. Decommissioning or Re-powering

At the end of the turbine life-span, the machines can be removed; alternatively, the turbines can be re-powered.

### 9.3.1. Decommissioning

Decommissioning should be planned well in advance of its occurrence.

Decommissioning of turbines could require planning permission unless covered by the conditions for planning permission for the development.

Notice may need to be given to the local authority in advance of decommissioning work.

It is commonly considered that the scrap value of the turbines should cover the cost of decommissioning. However, there is little experience in this regard. This position should be reviewed from time to time. Funds may need to be set aside for this purpose over the life of the project.

### 9.3.2. Re-powering

Experience abroad suggests that re-powering of wind farms is a more likely response to end-of-life turbines than permanent decommissioning. This could include replacement of main turbine elements, such as the generator, and possibly the blades, or the entire turbine might be replaced. Planning permission could be required.

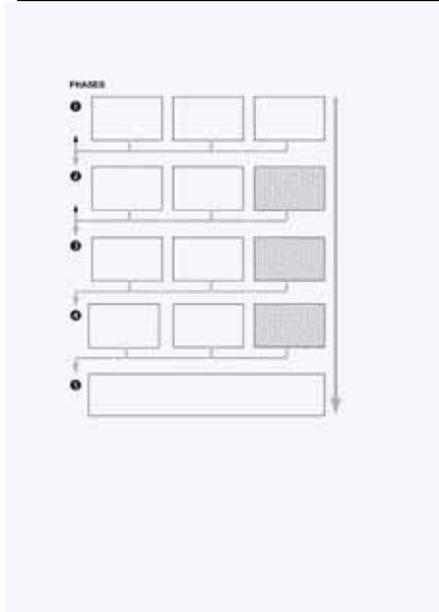
#### **Main Best Practice Points - Operation, Maintenance, and Decommissioning or Re-Powering**

- an environmental, health & safety management plan is recommended for the operation of the wind farm
- health & safety in wind farm operation should always be a priority
- public communications should be carried out as outlined in Section 9.2 above
- eventual de-commissioning should be planned for

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## 10. COMMUNITY CONSULTATION

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Consultation with the community is an important part of the development of a wind farm. Consultation processes can begin once a commitment has been made to develop the project. This could typically be after the feasibility study has been carried out, because until that time, no commitment to developing a wind farm is likely to have been made. A discussion of suitable approaches to consultation in the following stages of project development is given below:

- early project development stages
- EIA
- construction
- operation

### 10.1. Community Consultation in Early Project Development Stages

Local consultation should begin at an early stage before a planning application is submitted.

Ideally, a named contact person should be appointed to deal with queries, and contact details distributed among residents. Contact details for SEI's Renewable Energy Information Office (REIO) can also be given. The REIO provides independent information on renewable energy.

### 10.2. Community Consultation for Environmental Impact Assessment

As the project develops and the EIA is initiated, it may be desirable to consult with local community groups, particularly environmental groups. Local authorities maintain a listing of registered community and voluntary organisations. Good points of contact should be established on both sides. Information packs could be provided to each group if appropriate.

As before, neighbours can be visited in person. Neighbours should also be provided with information packs. Each neighbour should receive the same information.

A larger developer might wish to consider establishing a project-specific website, which would provide up-to-date material for interested parties. Contact details should be provided. An e-newsletter could also be considered.

### *Public Exhibitions*

Public exhibitions have been found to be a suitable and productive consultation format. The following points can be considered in the holding of a public exhibition:

- the exhibition should be held in the immediate locality if at all possible
- community halls or local schools can often be a suitable venue
- the exhibition should be prominently advertised in the local community, e.g., shops, community centres, public houses; it may be possible to have advertisements in church bulletins and church announcements
- local community groups should be specifically invited
- it is often best to hold the exhibition on a weekday rather than a weekend to ensure better attendance
- suitable exhibition hours run from mid or late afternoon until early or mid-evening, and should take account of dairy farming practices in relevant areas
- choice of day, time, and location should suit local conditions to ensure maximum attendance from the immediate locality
- maps, plans and illustrations should be plentifully used and prominently displayed
- it is important that the exhibition is adequately staffed; it is best that staff mainly be from the developer's organisation, as only the developer has authority to say what will or will not be done; landowners should ideally be present too, as should staff from the environmental consultancy (if any) preparing the EIS
- a draft copy of the EIA should be available if at all possible, because experience has shown that answers to queries are unlikely to be available otherwise
- a leaflet outlining the project should be prepared and distributed; it should include a location map of the proposed development, information on the developers and on the wind farm proposed, and contact details for queries
- the REIO may be prepared to attend or even to provide a (separate) stand, to provide independent advice to the local community, and may also provide information packs on wind energy

The EIA and planning stages can often be the most sensitive for local communities. Where significant concerns arise locally, it can be of assistance to offer to bring a group of residents to visit an operational wind farm. This can be a good means of dispelling inaccurate views of wind farm operation.

### **10.3. Community Consultation during the Construction Phase**

Neighbours and local community groups should be contacted in advance of and during construction. Contact details for the developer should be provided in the local community.

An information board can be displayed in a publicly accessible location, e.g. near the site entrance, giving contact details for the developer's site representative or other contact.

Where a developer has established a project website, it should be kept up-to-date during the construction period. Similarly, any e-newsletters should continue.

In the event of 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.

Consideration could be given to the formation of a community liaison group if appropriate.

Emergency procedures will need to be established for 24-hour support to the project works in case of unforeseen problems. The existence of these procedures should be notified to the

emergency services and the local authority, and can be referred to on the site information board.

#### **10.4. Public Communications During Wind Farm Operation**

Contact details will need to be made available to neighbouring residents and community groups. As before, if considered necessary, a more formal community liaison group could be established which would hold regular meetings.

It is a good idea to install a notice board at the entrance to the wind farm outlining information on the project. This could give information on:

- the developers or owners of the project
- the turbine numbers, make and model, dimensions, and name-plate rating
- the quantity of electricity generated in a year, and the equivalent number of houses this would supply
- quantity of avoided emissions
- contact details for queries
- information on any site visits or open days

A formal procedure should be established for recording and dealing with complaints from the public. The operator should investigate any complaints from individuals and, where appropriate, work with the relevant authorities to address any issues raised.

#### **Main Best Practice Points – Community Consultation**

- consultation with the local community is recommended at each relevant stage of the project, e.g., early project stages, EIA and planning, construction, and operation
- approaches to be taken to community consultation will vary, depending on the stage of development of the project

**Appendix A: Sources of Information for Wind Farm Feasibility Studies**



Raheen Wind Farm. Photo Courtesy of Ecopower Limited

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## Appendix A - SOURCES OF INFORMATION FOR WIND FARM FEASIBILITY STUDIES

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### *General:*

- <http://www.npws.ie> - all areas designated for environmental protection, recorded sites & monuments, aerial photographs, 6 " mapping, elevation contours, roads, streams
- <http://mida.ucc.ie> - all areas designated for environmental protection, national monuments, National Bedrock Geology map, soil distribution, soil classification, hydrology - main river basins, landscape character areas, land cover, Gaeltacht regions; mapping not great quality

DoEHLG "Wind Farm Planning Guidelines" (2006) is available at:

<http://www.environ.ie/en/Publications/DevelopmentandHousing/Planning/FileDownload,1633,en.pdf>

### *Cultural Heritage Information Sources:*

- DoEHLG record of sites & monuments – shortly available at [www.archaeology.ie](http://www.archaeology.ie)
- County Development Plan – available from the local authority, possibly on its website
- County Heritage Plan, if available – often also on the local authority website
- relevant Local Area Plans are available from the local authority, possibly on its website
- National Inventory of Architectural Heritage at [www.buildingsofireland.ie](http://www.buildingsofireland.ie)
- Ordnance Survey's Discovery Series 1:50,000 scale maps
- local information

The SEI wind map is at: <http://esb2.net.weblink.ie/SEI/MapPage.asp>

### *Identification of Existing Grid Connection Infrastructure*

Information on the location of the 10 kV, 20 kV, and 38 kV networks, and of 38 kV and 110 kV sub-stations, is given on ESB Networks' website at <http://www.esb.ie/esbnetworks/infrastructure/overview.jsp> . Information on the location of 110 kV and higher voltage networks can be readily obtained from the Ordnance Survey's Discovery Series 1:50,000 scale maps.

*Provision of Grid Connections* – Commission for Energy Regulation (CER) website: [www.cer.ie](http://www.cer.ie) .

### *Group Grid Connection Processing Approach:*

<http://www.cer.ie/en/electricity-transmission-network-decision-documents.aspx?article=981a3ac0-aed2-4dce-b5b2-d512652ff099> "Joint TSO/DSO Group Processing Approach - Pricing Principles Guidelines" (Feb 2007).

## Appendix B: List of Telecommunications Operators



Raheen Wind Farm. Photo Courtesy of Ecopower Limited

**Table A1: List of Telecommunications Companies**

Contact	Organisation	Address1	Address2	Address3	Address4
Frequency Planning and Coverage Department	Radio Telefís Éireann	Room 17	Annex 4	Radio Telefís Éireann	Donnybrook, Dublin 4
Corporate Affairs Division	Irish Aviation Authority	Aviation House Mountain View	Hawkins Street Central Park	Dublin 2	Dublin 18
Head of Radio Network	Vodafone,	76 Lower Baggot Street	Dublin 2	Leopardstown	
Transmission Department	O2 Ireland	Building P2	Dublin 2	Dublin 3	
General Manager	NTL Communications Limited		East Point Business Park		
Radio & Satellite Division	Eircom	6 <sup>th</sup> Floor	Telephone House	43 – 46 Marborough Street	Dublin 1
Technical Director	Meteor Mobile Communications Ltd.	4030 Kingswood Avenue	Citywest Business Park	Naas Road	Dublin 24
Chief Engineer/Transmission Manager	Chorus Communications Limited	LEDP	Childers Road	Roxboro	Limerick
	South Coast Television	Enterprise House	Ballinrea Road	Carrigaline	Co. Cork
	Irish Coast Guard	Unit 1	Rosemount Business Park	Ballycoolin Road	Dublin 11
Operations Manager	ESB Telecoms	27 Lr. Fitzwilliam Street	Dublin 2	Phoenix Park	
Director of Engineering	An Garda Síochána	Telecommunications Section	Garda HQ		Dublin 8
Broadcast Technician	TG4	Baile na hAbhann	Galway		

Please note that these contact details are subject to change.

## Appendix C: Main Consultees for Wind Farm EIAs



Arklow Banks Wind Farm. Photo Courtesy of Airtricity

**Table C1: Main Consultees for Wind Farm EIAs**

Contact	Organisation	Address			
Heritage Officer	An Taisce	Tailors Hall	Backlane	Dublin 8	
Senior Conservation Officer	BirdWatch Ireland Regional Tourist Authority	Rockingham House	Newcastle	Co. Wickow	
Manager Environment and Regional Coordination	Faite Ireland	Baggot Street Bridge	Dublin 2		
Planning Officer	The Heritage Council	Rothe House	Kilkenny		
Renewable Energy Division	Department of Communications, Energy and Natural Resources	4 <sup>th</sup> Floor, Selanta Centre	Nassau Street	Dublin 2	
Tourism Development Policy	Department of Arts, Sport and Tourism	Kildare Street	Dublin 2		
Regional Development Officer	Irish Farmers Association	Bog of Allen Nature Centre	Lullymore, Rathangan	Co. Kildare	
Conservation Officer	Irish Peatland Conservation Council				
Local NPWS Ranger					
regional NPWS ecologist					
Development Application Section	DOEHLG	7 Ely Place	Dublin 2		
REIO	Sustainable Energy Ireland	Shinagh House	Bandon	Co. Cork	
Planning Department	Relevant local authority				
local authority Heritage Officer(s)	Relevant local authority				
Coastal Zone Administration Division	Department of Communications, Marine and Natural Resources	Leeson Lane	Dublin 2		
Development Officer	Regional Fisheries Board				
	Irish Wildlife Trust	21 Northumberland Road	Dublin 4		
Irish Waymarked Ways Advisory Committee	Irish Sports Council	21 Fitzwilliam Square	Dublin 2		
	local Energy Agency				
Geotechnical Division	Geological Survey of Ireland	Beggars Bush	Haddington Road	Dublin 4	
Eirgrid Plc	27 Lower Fitzwilliam Street	Dublin 2			
ESB Networks Services Bureau	PO Box 29	Garrycastle	Athlone	Co. Westmeath	

Please note that these contact details are subject to change.

**Appendix D: Wind Farm Planning Permission**



Drumkerrin, Arigna. Photo Courtesy of Eco Wind Power Limited

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## Appendix D - WIND FARM PLANNING PERMISSION

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The planning process is subject to extensive legal requirements. Information is available from local authority and the DoEHLG websites.\*

It is considered that most developers will be advised at this stage by a planning or EIA consultant or an engineer, if such advice is not available to the developer in-house. The level of information given here reflects that. Only comments of particular relevance to wind farm planning applications are given.

Turbine dimensions will need to be given for planning purposes. As a particular make or model of turbine is unlikely to have been chosen at this stage, maximum likely dimensions should be given. Similarly, it will not be possible to state the exact electrical generation capacity of the proposed wind farm; however, a reasonable estimation can be given.

### Pre-Planning Meeting

On completion of the feasibility study, a pre-planning meeting with the planning authority can be sought, and indeed, will be expected by the planning authority for a project such as a wind farm.

### Submission of Planning Application

A high level of planning applications tend to be declared invalid by some local authorities. The nature of wind farm planning applications, and their size and scale in particular, relative to more typical applications received by a local authority, render them even more vulnerable to being declared invalid.

For this reason, the following checks can be made:

- where non-standard drawing scales are used, this will need to be agreed with the planning department in advance
- a local authority CAD technician can often provide assistance, should any difficulty arise in agreeing such matters
- the required fees can be checked in advance with the planning validation section
- the definition of the site boundary will need to be carefully considered
- where forestry is to be removed to facilitate the development, this can also require planning permission and an EIS, depending on the scale of deforestation; this can be incorporated into the planning application and EIS for the wind farm

Given the current position with the timescale for grid connections, and for other reasons outside the developer's control, it can be advisable to apply for planning permission which will be valid for a period significantly longer than usual. The normal duration of planning permission validity is five years. Some local authorities will view such proposals more favourably than others. This possibility is outlined in the DoEHLG Wind Farm Planning Guidelines.

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\* <http://www.environ.ie/en/DevelopmentandHousing/PlanningDevelopment/Planning/PlanningLeaflets/>

### Further Information Requests

Should significant queries arise during the planning process, they will usually be transmitted to the developer for a response through a Further Information Request from the local authority. Some will have arisen within the planning authority; some will arise as a result of objections or observations submitted by third parties.

### Strategic Infrastructure Development

An Bord Pleanála is required to make the decision on whether a development is strategic infrastructure development or not. Following receipt of an application, a wind farm of more than 50 turbines or more than 100 MW will only be considered to be strategic infrastructure when it exhibits one or more of the following properties:

1. the development would be of strategic economic or social importance nationally or regionally
2. the development would contribute “substantially” to the fulfilment of the National Spatial Strategy or any regional planning guidelines relevant to its proposed location
3. the development would have a significant effect on the area of more than one planning authority

Only after An Bord Pleanála has made this decision can the application be lodged either to the local authority in the usual way, or directly to the Strategic Infrastructure Division of an Bord Pleanála.

### Planning Appeals

A guide to the planning appeals process is given on An Bord Pleanála’s website.\*

An Bord Pleanála will generally not confine its decision to the matters raised on appeal. It will consider the application afresh, as if it has been made to it in the first place. However, if the only appeal is a first-party one, An Bord Pleanála does have the discretion to consider only the planning conditions, and not review the application afresh.

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\* <http://www.pleanala.ie/appealpack/howtomake.html>

**Appendix E: Permits, Contracts and Construction – Supplementary Information**



Carnsore Point Wind Farm. Photo Courtesy of Hibernian Windpower

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## Appendix E- PERMITS, CONTRACTS AND CONSTRUCTION – SUPPLEMENTARY INFORMATION

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Legal advice will be required in respect of all contracts. Certain contracts will require solicitors to be experienced in a certain field, e.g., construction law. The following topics are outlined in brief below:

- grid connection contract
- company structure
- wind turbine supply contract
- sale of electricity
- wind farm construction contract
- contract with owner's engineer
- operations and maintenance contract
- finance
- other permits and authorisations
- miscellaneous items during the construction stage

### Grid Connection Contract

Information on making a grid connection application is available at the CER website.\* In particular, information on the grid connection Group Processing Approach can be found in the document "Joint TSO/DSO Group Processing Approach - Pricing Principles Guidelines" (Feb 2007).† The publications referenced in Appendix 3 of that document ("Relevant Published Documentation") also give good guidance.

Current advice is to make an application as soon as there is any reasonable idea of the proposed capacity of the wind farm.

Immediately on receipt of a grid connection offer, a detailed technical and economic analysis of the offer will need to be carried out. If any concerns are identified, Eirgrid/ESB Networks can be contacted for discussion. Should these discussions fail to lead to agreement, the relevant aspects can be referred to the CER for resolution, bearing in mind the deadline for this.

The arrangement and structuring of finance to allow acceptance of the grid connection offer will need to be given consideration in advance, due to the tight timeframe, and the significant sums of money involved.

### Company Structure‡

It is common for a Special Purpose Vehicle company to be established for the development of a wind farm. It is typically on this basis that a project is financed. A Memorandum of Agreement, Articles of Association, and a Shareholders' Agreement will be required.

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\* [www.cer.ie](http://www.cer.ie)

† <http://www.cer.ie/en/electricity-transmission-network-decision-documents.aspx?article=981a3ac0-aed2-4dce-b5b2-d512652ff099>

‡ based on File 25 from the Renewable Energy partnership's "To Catch the Wind" (2004), and Matheson Ormsby Prentice presentation at *Meitheal na Gaoithe* workshop, Kilmainham, 27 May 2003

## Wind Turbine Supply Contract

The advice of an experienced Owner's Engineer, or of a solicitor experienced in construction procurement, should be sought before finalising a purchase contract.

It is normal practice for the wind turbine manufacturer to provide a warranty for between two and five years. This will often cover lost revenue, including downtime for repair.

## Sale of Electricity

A review of the current markets for electricity should be undertaken, as this does change over time. There are currently three options for selling electricity generated by the wind farm:

- to an electricity utility under the government's renewable energy feed-in tariff (REFIT) scheme
- to an electricity utility under a merchant/private power purchase agreement, outside the REFIT scheme (under the new single electricity market - SEM)
- other potential opportunities through the opening of the SEM

These options are briefly outlined below. Provision for any future green certificates (or similar) will need to be given some attention in the PPA.

Auto-production is an alternative use of the generated electricity, in which interest is steadily increasing.

### REFIT

The current government support mechanism is the REFIT scheme. REFIT terms and conditions, and clarification on queries, is given on the DoCMNR website.\* The current round of REFIT is not yet fully subscribed, as additional capacity has been added to it due to the surrender of AER contracts. The government has reiterated its support for REFIT in its White Paper (February 2007).

A good discussion of REFIT is given by A&L Goodbody Solicitors on their website.†

### Merchant Power Purchase Agreements

Private or merchant power purchase agreements are also available from time to time from the electricity utilities, which are listed on the CER website.‡

### Changes in the Market for Renewable Energy Generators

The SEM was fully introduced in November 2007. This has resulted in significant changes in market operation. Information on how the SEM is operating is available on the Eirgrid website.§

\* <http://www.dcmnr.gov.ie/Energy/Sustainable+and+Renewable+Energy+Division>

† <http://www.algoodbody.ie/energy/naturalresources/refit>

‡ <http://www.cer.ie/en/electricity-retail-market-licences.aspx?article=e3616c02-d62f-4d73-b59b-9dc708ee4d34>

§ [www.eirgrid.ie](http://www.eirgrid.ie)

### Auto-production

Auto-production is an alternative use of the electricity, which could be very favourable economically in some instances. This is where a developer operates one or more turbines to provide electricity for internal consumption at a particular facility. Interest in auto-production is increasing rapidly from a broad range of sectors, including industry, local authorities, and educational institutions.

### **Wind Farm Construction Contract**

While technical aspects such as obtaining a grid connection or planning permission tend to be of most concern to a developer, it is the construction stage, and particularly delay or cost overruns, which tend to cause most concern to financial institutions.

A developer is strongly advised to acquire the advice of an owner's engineer on the specification of Employer's requirements, conditions of contract, on co-ordinating contractors if required, on administering the contract, on evaluating claims, and on certifying payments. Some developers may have these skills in-house.

The use of local contractors is recommended, quality and cost-effectiveness allowing.

### Procurement Procedures

Procurement procedures for the construction contract will require the following:

- preparation of contract documents
- specification of employer's requirements and Scope of Work
- preparation of tender package
- management of procurement process
- assessment of tenders
- provision of recommendation on successful tenderer

### Contract Documents

The structure and type of construction contract should be given significant consideration. An outline of these matters is given below.

#### *Structure of Construction Contract*

The structure of the contract can typically vary as follows:

1. design & build contract with lead contractor only
2. design & build contract in multi-contracting

"Traditional" contracts, where design and construction processes are carried out separately by the consulting engineer and the contractor respectively, are not common in the wind energy industry in Ireland.

## Design & Build Contract Led by Main Contractor

In Ireland, wind farms are frequently constructed under a design & build or turnkey contract. This means that the contractor effectively takes on the role of both designer and contractor. The contractor – often the turbine manufacturer - will then usually sub-contract the civil, structural and electrical design and construction elements to other parties.

This sub-contract might be to one balance-of-plant contractor, which might in turn be a joint venture company set up by an electrical contractor together with a civil & structural contractor. Alternatively, the manufacturer might engage the electrical and civil & structural contractors on separate sub-contracts. These contractors will typically in turn employ electrical and civil & structural designers.

The difficulty with these arrangements is that the wind turbine manufacturer's primary business is to manufacture and sell turbines. They manage construction contracts because they are obliged to in most cases, to see their turbines sold and built. Some wind turbine manufacturers, therefore, will engage only in the supply and installation of the turbines. They will not perform in the role of lead contractor, which requires taking responsibility for and co-ordinating sub-contractors, etc. Instead, they may accept a position on the construction team if another party, such as the Balance-of Plant contractor, takes the role of lead contractor. Lending institutions could have a preference for one point of contract, to assist in avoiding protracted legal problems.

## Multi-Contracting

Multi-contracting means that there is no lead contractor. All major parties contract directly with the developer. The client in this case will need to perform a very significant co-ordinating role.

Difficulties can arise where co-operation and consultation is required between the various parties involved. It is very important to establish in the contracts that a high level of co-operation and consultation is required. The contract should indicate a requirement for the structure and methodology for ensuring that this takes place. How this is set out is critical. The importance of clear and agreed co-operation and communication structures will not be evident on a contract where all parties are co-operating and communicating well, and a good level of goodwill is present at all levels. However, where relationships have deteriorated, and little goodwill is present between the parties, then the contractual obligations become important.

For these reasons, multi-contracting is not an approach to be undertaken lightly. However, if operated successfully, it can lead to cost savings. Lenders may take a view on the risk associated with multi-contracting, depending on the experience of the developer.

## *Type of Construction Contract*

The advice of an owner's engineer with suitable experience in contract management should be sought on the choice of contract, whether in-house or externally. Some contracts will expose the client to greater risk; others will expose the contractor to greater risk. The contractor can be expected to price accordingly. Some contractors may have no interest in operating under certain types of contracts. Therefore there will be a trade-off for the client in terms of risk vs. price. It is up to the client (or the bankers) to decide how much risk exposure is acceptable in the particular circumstances. A large company with a significant level of expertise (which reduces risk), and a portfolio of projects (across which risk can be spread) will have a different approach to risk than a landowner-developer with no experience in construction and one small project. As an example, some of the FIDIC forms of contract are mentioned below. FIDIC contracts are in use internationally and are therefore usually familiar to most parties to the contract. They include:

- Silver Book (EPC/Turnkey Contract)

- Orange Book (Design-Build and Turnkey)
- Yellow Book (Plant and Design-Build)
- Red Book (Civil Engineering Contract)
- Green Book (Short Form of Contract)

The Silver and Yellow Books will be of principal interest; however, the Red or Green Books may be of some interest in a multi-contract situation. The Owner's Engineer will advise on the suitability of contract type.

Lending institutions are likely to take an interest in the type of contract utilised. Banks will typically have a preference for fixed, lump-sum contracts. Fixed, lump-sum contracts are really only at their most useful where a clear and detailed scope of work has been provided. Otherwise, where the scope of work is unclear or incomplete, variations to the contract, outside the agreed scope of work, are likely to occur. This is likely to increase costs.

### Employer's Requirements and Scope of Work

The more detailed the tender documents, the more likely the Employer is to achieve the desired objectives. The difference here between the Design & Build approach as opposed to the Traditional Contract, is that it is through performance criteria, quality specification, and tests that the requirements are set, rather than through a detailed design. For this reason, tender documents need to be drafted with care.

It is advisable that a preliminary design be carried out. This will allow the preparation of a detailed Scope of Work. Good attention should be paid to the payment schedule.

Detailed site investigation information should be available. This is particularly important. The site investigation should be designed with care. This can be a worthwhile investment, as it can reduce a Contractor's risk so that a more competitive price can be tendered.

The aim in providing as much information as possible to the Contractor is so that as much risk can be transferred as possible, and at the lowest cost.

The Employer should require that the works be supervised by a Resident Engineer, at least part-time. This means that the Engineer can certify that the works have been built in accordance with the design.

The Contract should state that the Contractor must construct the wind farm in compliance with planning conditions and EIA requirements, and must construct it such that it can be operated in compliance with these conditions and requirements. Detailed requirements for testing, verification, and compliance of the wind farm's operation should be outlined. Where applicable, care should be taken to outline the interface between contracts, definition of roles and responsibilities, the interfaces between various contractors, and between contractors and the Employer, etc.

### Project Supervisor Design Process and Project Supervisor Construction Stage

Health & Safety requirements are outlined in Chapter 8 and Appendix F of this document. It will be usual to anticipate that in a Design & Build Contract the Contractor will accept the responsibilities of the Project Supervisor Design Process (PSDP) and Project Supervisor Construction Stage (PSCS), once found to be competent and adequately resourced. This will need to be a separate written appointment, and confirmed in writing by the Contractor.

The developer will need to have regard to the timeframe of the project to ensure that the works are adequately resourced for safe construction. This is a specific requirement of health & safety legislation.

### Typical Sources of Construction Claims

Most construction claims will typically be related to the following:

- variations and consequent claims due to an incomplete or unclear scope of work
- delays outside the Contractor's control
- inadequate tender documents
- unforeseen ground conditions
- inadequate site supervision

Where the developer has control of these matters, there is an opportunity to reduce the risk of claims (e.g., by providing a complete and clear scope of work, good tender documents, thorough geotechnical survey, adequate site supervision, and by minimising delays to the contractor where this is possible).

### **Contract with Owner's Engineer**

Two possible model contracts between the Employer and the Owner's Engineer are:

- FIDIC White Book – Client/Consultant Model Services Agreement
- Association of Consulting Engineers of Ireland, Agreement CE 9201 - For the Appointment of Consulting Engineers for Civil Engineering Work

### **Operations & Maintenance Contract<sup>\*</sup>**

There should be sufficient redress through warranties if equipment fails during the operation of the wind farm. However, manufacturers' warranties will frequently only cover the equipment for the first two to five years, creating an element of risk in the latter years of the project. It is necessary therefore to have O&M contracts, with service fees, in place with the manufacturers or others.

The operation and maintenance (O&M) contract will require a defined duration, with performance standards, and should contain a right to replace the operator for non-performance.

A performance regime should be included as a benchmark, with a requirement for full operating records to be maintained and provided to the client on request. Variations and any right to sub-contract could be considered, with appropriate default or step-in clauses. Force majeure, and the circumstances in which it applies, should be included in the contract, particularly if the contractor is not Irish. The operating contractor will need to be certified to operate electrical equipment or otherwise this could negate the O&M contract.

### **Finance<sup>†</sup>**

Having acquired all the necessary consents, bringing a wind farm to construction is primarily focussed on the technical pre-requisites for putting finance in place so that a contractor can be procured.

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<sup>\*</sup> from File 25 of "To Catch the Wind" by the Renewable Energy Partnership and the Western Development Commission (2004)

<sup>†</sup> based on: Triodos Bank & The WindFund, "A Breath of Fresh Air – Project Finance and Equity Investment for Smaller-Scale Wind Power" (1998)

## Economic Assessment

Financial analysis is carried out throughout the project, by the developer or financial advisor, at a level which is appropriate for the relevant stage of the project. Both the wind farm as a whole and each individual turbine will need to be subjected to this analysis. The following financial models can be used directly by the developer:

1. RETScreen software\*
2. the CD accompanying “To Catch the Wind”; from the Western Development Commission†

This is not a substitute for professional advice.

## Procurement of Finance

Financial arrangements and the financing method can have as much of an effect on the commercial viability of a wind farm as the wind regime does. It is critical that as much attention is paid to this work as to the design and planning stage.

The difficulty of raising finance on acceptable terms for a wind energy project should not be underestimated, especially for developers with limited resources and no previous experience in establishing similar projects.

It is strongly advised that, unless the developer has the skills in-house, the services of an independent financial adviser be obtained to assist in the procurement of finance, and assessment and comparison of finance options. The financial adviser will also assist in negotiating with banks and other financial institutions, and in preparing the developer in setting up the various requirements that must be set in place.

The following points are particularly important with regard to finance:

- the process of arranging finance is time-consuming and therefore should be undertaken in a timely manner
- problems could emerge that require determination and ingenuity to overcome
- much of the preparation can and should be carried out well in advance
- technical, contractual, and consent aspects of a project can all affect financing
- project lenders will carefully scrutinise every aspect of the project; attention to detail and anticipation of lender concerns is an important component of this process

The technical difficulties of a project, which in themselves can appear daunting, can often be exceeded by the complexities of arranging the necessary finance.

Financing may have to be put in place over a very tight timeframe, in some instances between the offer of a grid connection and its acceptance. Therefore it is very important that all preparatory work has been done well in advance.

A source of advice on this and broader finance matters is the UK DTI's “Financing Renewable Energy Projects – A Guide for Developers” ETSU K/FR/00028/REP.‡

## Finance Documentation

\* available at <http://www.retscreen.net/ang/home.php>

† available at <http://www.wdc.ie>, but the CD will need to be acquired directly – contact details are on the website

‡ available at <http://www.dti.gov.uk/files/file15118.pdf>

When initiating and developing a wind farm, certain key documents will be required by the bank or investment fund providing the loan. Usually, this documentation will be a prerequisite before any bank will consider providing debt finance to the project.

It is critical to plan ahead to ensure that all the documents are inter-related and consistent, particularly when seeking finance, to guarantee the “bankability” of the project. Failure to have the appropriate agreements in place can at best cause delays or cost over-runs, and at worst ensure that the project is non-bankable, failing to get financial support, with non-recoupable costs. This documentation can include:

- the loan facility agreement
- debenture
- first charge on issued share capital
- company documentation
- planning permission
- grid connection agreement
- land lease
- Declaration of Identity
- wind data analysis
- turbine certification documentation
- power purchase agreement and assignment documentation
- construction contract
- construction warranty agreement
- wind farm services and warranty agreement
- operation and maintenance agreement
- insurance documentation
- legal opinion, including ascertaining the validity of foreign legal documents

## **Other Permits and Authorisations**

### CER Licence and Authorisation

Applications for an authorisation to construct or reconstruct a generating station, and for a licence to generate electricity will need to be made to the CER. Applications can be made at any time once the developer has available the required information. These applications are not necessarily a difficult process in themselves, but can be onerous in terms of the time required to compile all the required documentation. The process for smaller projects is significantly simplified.

Application forms and related guidance are available from the CER.\*

### Accession to the Trading and Settlement Code

Accession to the Trading & Settlement Code is required for all generators except those under 1MW. On obtaining the necessary consents from the CER, application can be made to Eirgrid (Settlement System Administrator – Market Support Division). The accession process is prescribed in agreed procedure 9 under the Code, and is published on Eirgrid’s website, which gives an outline of the accession process.†

## **Miscellaneous Items during the Construction Stage**

Items which, if not given timely attention, could lead to construction delays include:

- requirement for agreement with the local authority on planning conditions
- compliance with planning conditions which require pre-construction surveys, some of which could be seasonal
- early and regular consultation with Eirgrid

\* <http://www.cer.ie/en/electricity-generation-licences-and-authorisations.aspx>

† <http://www.eirgrid.com/EirgridPortal/uploads/Market%20Operations/Market%20Access%20Requirement%20Process.pdf>

### **Main Points – Permits, Contracts and Construction – Supplementary Information**

- the advice of an experienced owner's engineer, or of a solicitor experienced in construction procurement, should ideally be sought before finalising a turbine purchase contract
- a developer is strongly advised to acquire the advice of an owner's engineer on the type of contract, specification of employer's requirements, conditions of contract, on co-ordinating contractors if required, on administering the contract, on evaluating claims, and on certifying payments
- construction works should ideally be supervised by a resident engineer, at least part-time
- independent financial advice is recommended



**Appendix F: Supplementary Construction Health & Safety Information**



Largan Hill Wind Farm, Co. Roscommon. Photo Courtesy of Eco Wind Power

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## Appendix F - HEALTH & SAFETY IN CONSTRUCTION

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The discussion of health & safety in this document relates to requirements for new construction projects coming under 2006 legislation; transitional arrangements are in place for projects already operational under previous legislation.

### Appointment of Project Supervisors - Checklist for Clients

A checklist for Clients with regard to the appointment of project supervisors is given below:

- A competent and adequately resourced PSDP should be appointed before the start of any design work.
- The competence and resources of the PSDP can be checked by asking for information on:
  - experience of carrying out similar projects
  - safety and health training or qualifications
  - the resources intended for use on the project
  - evidence of a good safety record, e.g., accidents, notices issued by the HSA, and any prosecutions
- A competent and adequately resourced Project Supervisor Construction Stage will need to be appointed.
- The competence and resources of the PSCS can be checked by asking for information on:
  - experience of carrying out similar projects
  - safety and health training or qualifications
  - the resources intended for use on the project
  - evidence of a good safety record, e.g., accidents, notices issued by the HSA, and any prosecutions
- Co-operation with the project supervisors is required. This requires a client to:
  - give them any information available on the state or condition of a structure or of the site
  - give the Safety File to the PSDP, if available
  - set a realistic time frame for completion of the project, as rushing a project can lead to accidents
- If the project is to take longer than 30 days or 500 person days, then the client must notify the Authority of the appointment of the PSDP and, if the PSCS has been appointed, must include this information in the Notification to the HSA.
- A client should provide a copy of the preliminary Safety and Health plan to all those being considered for, or tendering for the role of project supervisor for the construction stage
- The Client is required to keep the Safety File prepared by the PSDP when the project is completed.

Clients of small projects or persons who have never been a Client before can seek advice from the Health & Safety Authority in relation to their duties.

**Appendix D: Wind Farm Planning Permission**



## Definitions

**Construction work** means the carrying out of any building, civil engineering or engineering work, other than drilling and extraction in the extractive industries, and includes but is not limited to each of the following:

- (a) the doing of one or more of the following with respect to a structure:
  - (i) construction
  - (ii) alteration
  - (iii) conversion
  - (iv) fitting out
  - (v) commissioning
  - (vi) renovation
  - (vii) repair
  - (viii) upkeep
  - (ix) redecoration or other maintenance (including cleaning which involves the use of water or an abrasive at high pressure or the use of substances or preparations classified as corrosive or toxic)
  - (x) de-commissioning, demolition or dismantling
- (b) the preparation for an intended structure, including but not limited to site clearance, exploration, investigation (but not site survey) and excavation, and the laying or installing of the foundations of an intended structure
- (c) the assembly of prefabricated elements to form a structure, or the disassembly of prefabricated elements which, immediately before such disassembly, formed a structure
- (d) the removal of a structure or part of a structure or of any product or waste resulting from demolition or dismantling of a structure or disassembly of prefabricated elements which, immediately before such disassembly, formed a structure
- (e) the installation, commissioning, maintenance, repair or removal of mechanical, electrical, gas, compressed air, hydraulic, telecommunication and computer systems, or similar services which are normally fixed within or to a structure

### **Particular Risks in Construction**

*Schedule 1 of the Safety Health & Welfare at Work (Construction) Regulations – 2006*

*Non-exhaustive list of work involving particular risks to the Safety, Health and Welfare of persons at Work*

1. work which puts persons at work at risk of:
  - (a) falling from a height,
  - (b) burial under earthfalls, or
  - (c) engulfment in swamplandwhere the risk is particularly aggravated by the nature of the work or processes used or by the environment at the place of work or construction site
2. work which puts persons at work at risk from chemical or biological substances constituting a particular danger to the safety and health of such persons or involving a statutory requirement for health monitoring
3. work with ionising radiation requiring the designation of controlled or supervised areas as defined in Directive 96/29/Euratom2
4. work near high voltage power lines
5. work exposing persons at work to the risk of drowning
6. work on wells, underground earthworks and tunnels
7. work carried out by divers at work having a system of air supply
8. work carried out in a caisson with a compressed-air atmosphere
9. work involving the use of explosives
10. work involving the assembly or dismantling of heavy prefabricated components

### **Phased Construction Work**

Where the work is phased, with significant and substantial periods of time in between the phases, it may be appropriate to consider each separate phase as an individual project. An example of this would be a demolition operation far in advance of further site work. It may also be appropriate to use this approach on complex or lengthy projects that pass through several distinct stages, each requiring a specialist managerial input. Where structures are being constructed in different locations with separate sites and access and egress points and where there is minimal interaction between the work of each site, it may be appropriate to consider each separate site as an individual project.

### **Further Information on Health & Safety in Construction**

Further information is available from the HSA.\*

The “Guidelines on the Procurement, Design and Management Requirements of the Safety Health and Welfare at Work (Construction) Regulations 2006” provides detailed guidance on each of the topics dealt with in Section 8 of this document. It is available from the HSA.†

Relevant legislation includes:

- Safety Health and Welfare at Work Act 2005
- Safety Health and Welfare at Work (General Application) Regulations
- Safety Health and Welfare at Work (Construction) Regulations 2006
- Safety Health and Welfare at Work (Work at Height) Regulations 2006

Other regulations deal with noise, vibration, chemical agents, and asbestos. Details on these matters are available from the HSA website.

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\* [www.hsa.ie](http://www.hsa.ie)

† <http://publications.hsa.ie/index.asp?locID=6&docID=200>

## Appendix G: Notes on Wind Farm Insurance



Meenadreen Wind Farm, Co. Donegal. Photo Courtesy of Eco Wind Power

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## NOTES ON WIND FARM INSURANCE

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Insurance is likely to be required for the following:

- all-risks cover for equipment, e.g., towers, nacelles, blades, transformers, computers, generators, cabling, foundations including cover for fire, lightning, malicious damage, storm, theft, accidental damage, subsidence, breakdown
- reinstatement cover
- loss of revenue during replacement or repair of turbines and other equipment
- failure of power supply
- contingency cover for sub-contractors
- third party liability
- employer's liability
- motor insurance

Non-core insurances could include:

- *force majeure*
- keyman (loss of key staff member or third party crucial to project)
- professional indemnity
- archaeological finds
- commercial "all risks"
- fidelity guarantee

### Commonly Encountered Insurance Problems\*

The following commonly encountered insurance problems can be considered in formulating insurance packages:

- non-compliance with the insurance provisions of the credit agreement, effectively putting the borrower into default with respect to financing
- inadequate limits of indemnity and/or sums insured
- not fully noting the interest of the financial institution, or failing to make it the first loss payee
- the use of standard policy wording which is not tailored to the risk and does not provide adequate cover
- ambiguously worded insurance documentation which could allow underwriters to avoid claims
- failure to finalise insurance documentation by agreed dates, delaying either financial close or first draw-down
- lack of appreciation of the insurance market and its limitations, creating false expectation with financiers
- unrealistically high self-insured amounts which could create cash-flow problems
- not advising financial institutions of changes to insurance policies, leading to a breach of the terms and conditions of the loan

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\* "Insurance Considerations for Renewable Energy Projects – A Guide for Developers," ETSU K/FR/00031/REP/S

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<sup>\*</sup> discontinued, but still available from the American Wind Energy Association; contact details at [www.awea.org](http://www.awea.org)

<sup>†</sup> available at <http://webstore.iec.ch/webstore/webstore.nsf/arthurm/035360>

<sup>‡</sup> available at [http://www.ieawind.org/Task\\_11/RecommendedPract/11%20Anemometry\\_secondPrint.pdf](http://www.ieawind.org/Task_11/RecommendedPract/11%20Anemometry_secondPrint.pdf)

<sup>§</sup> available at <http://www.nrel.gov/docs/legosti/fy97/22223.pdf>

<sup>\*\*</sup> <http://www.algoodbody.ie/energynaturalresourcesrefit>

<sup>††</sup> <http://www.cer.ie/en/electricity-transmission-network-decision-documents.aspx?article=981a3ac0-aed2-4dce-b5b2-d512652ff099>

<sup>‡‡</sup> available at <http://www.awea.org/index.php?id=91>

<sup>§§</sup> available at <http://www.wdc.ie>, but the CD will need to be acquired directly – contact details are on the website

<sup>\*\*\*</sup> available at <http://www.sei.ie/uploadedfiles/FundedProgrammes/ImpactofWindTurbinesRadarStudyFinal.pdf>

<sup>†††</sup> available at <http://www.dti.gov.uk/files/file15118.pdf>

**Appendix D: Wind Farm Planning Permission**





