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1 Context

1.1 The development of alternative energy sources is a priority, nationally and at European level, for both environmental and energy policy reasons. At national level, the Government's Programme for Renewal undertakes to "set targets for electricity generation from renewable sources and remove any remaining obstacles such as the lack of proper pricing and adequate incentives to their integration with the national grid." The National Development Plan, 1994-1999, has identified, as a primary objective, the production of as much of the Country's energy requirements from indigenous sources as is economically possible. It also proposes that initiatives be undertaken to develop alternative energy sources.

1.2 The Fifth European Action Programme on the Environment ("Towards Sustainability") has identified the development of strategic energy programmes, particularly renewable energy options, as a key element within its short to medium term energy strategy. The ALTENER programme, for promotion of renewable energy sources, aims to triple production of energy from such sources within the European Union in the period 1991 to 2005.

1.3 As part of international action to tackle the problem of climate change, the European Union is committed to stabilising carbon dioxide (CO₂) emissions, the principal greenhouse gas implicated in climate change, in the Union as a whole at 1990 levels by the year 2000. In line with this overall EU objective, Ireland has also adopted a National CO₂ Abatement Strategy designed to limit the growth in national CO₂ emissions. As man-made emissions of CO₂ arise mainly from the combustion of carbon-based fuels for energy needs, Ireland's CO₂ strategy has, inter alia, identified the contribution that wind and other alternative energy sources can make towards limiting CO₂ emissions. By replacing carbon-based fuels in electricity generation, wind power can help limit CO₂ and other emissions (such as sulphur dioxide, nitrogen oxides and smoke) associated with the generation of electricity.

1.4 In response to these policy priorities, the Electricity Supply Board, at the request of the Department of Transport, Energy and Communications, initiated a competitive scheme to develop, by the end of 1997, new installed electricity generating capacity using alternative

energy sources under the Alternative Electricity Requirement. Such sources include combined heat and power (CHP) and renewable energy such as hydro, wind, landfill gas, biomass and waste. The Minister for Transport, Energy and Communications has now approved the offer by the ESB of Power Purchase Agreements for the development of over 100 megawatts (MW) of capacity from alternative sources. The breakdown, by technology categories of the approved projects is:

73MW Wind Power; (10 projects)
22MW CHP; (8 projects)
12MW Biomass/Waste/Other (6 projects)
4MW Small-scale Hydro; (10 projects)

1.5 To encourage diversity a ceiling of 15 mw was set for anyone project or developer. With a minimum of 1mw for wind projects.

1.6 As an immediate result of this scheme, there will be a growth in the number of planning applications for wind farm developments. These Guidelines are intended to facilitate planning authorities in dealing with such planning applications and in making appropriate provision in development plans for possible future proposals. It is hoped that they will also be of assistance to developers and the general public in considering such proposals.

1.7 Local authorities are reminded of their duty under the Local Government Act, 1991, in the performance of their functions under any enactment, to have regard to policies and objectives of the Government or any Minister in so far as they may affect or relate to their functions. National policy on renewable energy resources is such a policy to which regard should be had in the exercise of planning functions.

2 The Technology of Wind Generators

2.1 Ireland has one of the richest wind energy resources in Europe. Areas with a mean wind speeds at hub height of about 8 metres/second (8m/s) or above are regarded as having a significant wind resource. Electricity is produced from wind energy by means of wind turbines. These generally consist of a steel or concrete tower which supports the generating machinery, a "yaw" mechanism to turn the rotor into the wind, and the rotor blades themselves. Towers are fixed to a concrete pad foundation of, typically, 7 metres (m) diameter. Wind turbines come in a variety of forms, with horizontal or vertical axes, and two or three rotors measuring anywhere from less than 1m diameter up to 50m across.

2.2 While these guidelines relate to the provision of one or more turbines, wind farm developments in Ireland are likely to be made up of groups of medium-sized turbines rated at 300-600 kilowatts (kW) each, with vertical rotors of 30-40m diameter and a hub height of 30-40m. Turbines in the range up to about 1.2 mw will be available in the near future. Planning authorities and developers will then have the option of considering whether use of a smaller number of larger diameter turbines gives rise to less visual intrusion than a greater number of smaller diameter turbines, for a given power output. The specifications of the Alternative Energy Requirement are such that farms may consist of anything between three and fifty turbines. In order to ensure the aerodynamically efficient operation of turbines, they require to be sited 5-10 rotor diameters apart. Consequently, while the "footprint" of each individual turbine is quite small, wind farm developments are extensive in nature, occupying significant areas of land.

2.3 The use of wind for power generation requires that turbines be located in areas with significant wind energy resource. Areas of high wind energy tend to be upland and/or coastal. However, excessively windy sites may be unsuitable because of engineering constraints. Most turbines are designed to shut down automatically when the wind speed exceeds about 25 m/s (Force 10 on the Beaufort Scale) and to start up automatically when it has dropped to a lower level. Support structures of turbines operating at higher wind speeds are also more costly. The development of wind

farms also requires relatively even terrain, for a reasonably uniform wind energy resource and to facilitate development at a reasonable cost. Because tall trees can hinder the flow of wind, the location of wind turbines in the vicinity of conventional long rotation forestry is generally not appropriate. However the location of wind turbines in the vicinity of short rotation forestry may be a particularly appropriate use of land, both in energy and environmental terms. In either case, a distance of 500m from the tree line is regarded as adequate from the developers' point of view. Other locational considerations include ease of vehicular access and of connection to the electricity grid.

2.4 The western and north-western parts of the country have the greatest wind resource, in terms of average speeds. However, there may be constraints on development in these areas such as inaccessibility, lack of energy infrastructure, excessive winds, and extensive areas of high visual amenity. Those areas of the midland bogs with sufficiently high average wind speeds are also likely to be suitable for development; substantial energy infrastructure is in place from the development of the peat industry, and the flat landscape permits a steady wind flow, which is of benefit to wind farms.

2.5 A wind farm is generally monitored and controlled via a computerised system, with an on-site control unit (generally unmanned), linked to a remote headquarters. In addition, one or more control masts with equipment for measuring wind speed and direction are usually needed.

2.6 Any wind farm development will require ancillary developments, including temporary access for construction, permanent access for servicing, communications infrastructure for control, and grid connection works (transformers, sub-stations, distribution, transmission lines etc.).

2.7 The generated electricity from a wind farm will be exported via an ESB overhead line to the ESB's distribution/transmission system at voltages, depending on location and size of the wind farm, of either 10 kilovolts (kV), 20 kV, 38 kV or 110 kV. The majority of wind farms are likely to export electricity at 38 kV.

3 Wind Energy and the Development Plan

3.1 Each planning authority's development plan should incorporate a statement of the authority's policies and objectives in relation to wind energy/wind farm development and of the matters to which it would have regard in assessing any application for a wind farm.

3.2 The policy statement should include the following:

- acceptance of importance of wind energy as a renewable energy source when carried out in an environmentally acceptable manner.

- an indication of the factors which would determine whether or not wind farm development would be open for consideration in a particular area. These would include:
 - whether an area has significant wind energy potential on the basis of the nature and extent of the wind resources in the area,
 - the suitability/strength of the grid and accessibility to it,
 - the suitability of the site, having regard to its other land use policies, including the need to protect areas of important built and natural heritage from inappropriate development, and
 - any other (local) planning considerations, including measures to minimise the impact of proposed wind farms in the local environment.

3.3 Planning authorities may wish to indicate in their development plans objectives for the use solely or primarily as wind farms of sites with significant wind energy potential.

3.4 It is appreciated that, in the short term, planning applications for wind farm development may have to be considered in the absence of specific policies as at 3.2 above. In the longer term, however, a local policy context will facilitate authorities, developers and the wider community in assessing proposals.

3.5 Planning authorities should consult appropriate bodies at an early stage of development plan preparation. The Department of Transport, Energy and Communications, The Irish Energy Centre, the E.S.B. and the wind energy industry should be consulted in respect of areas of potential development. The Department of Arts, Culture and the Gaeltacht, the Office of Public Works, the Forest Service of the Department of Agriculture, Food and Forestry, Coillte and other appropriate statutory and non-statutory bodies should be consulted in respect of areas which may require special protection.

4 Development Control and Wind Energy

4.1 In considering planning applications, planning authorities should have regard to all relevant planning issues, including those dealt with hereunder, any relevant provisions in the development plan and the proper planning and development of the area generally.

Discussions and Consultations

4.2 It is advisable for developers to contact the relevant planning authority at the earliest possible stage, in advance of any application. Pre-application discussions will generally be useful. For example, the connecting powerlines between the wind farm and the grid connection may have a considerable visual impact and the routing should be discussed with the planning authority and the ESB at this stage. Wind farms are complex developments and their impacts are also quite responsive to relatively small changes in design.

4.3 Developers should also seek to consult local communities on proposals at an early stage. Such an approach will both alert developers and decision-makers to the concerns of the community and inform the public of what the actual impact of any development is likely to be.

4.4 Environmental Impact Assessment (EIA), under the European Communities (Environmental Impact Assessment) Regulations, 1989, is not an explicit requirement for wind farm developments. However, the Environmental Council adopted a common position on amendments to Directive 85/337/EEC at their meeting on 25 June, 1996, the effect of which, upon formal adoption, will be the extension of the EIA procedures to wind farms meeting criteria thresholds to be set down by the individual Member States. Accordingly, detailed information, of a level commensurate with the requirements for an EIS under the statutory provisions for EIA, on the environmental impact of a proposed development, is likely to be necessary for a planning authority to assess a planning application. Best practice would suggest the provision, by the developer, of such a statement as a matter of course. However, where a planning authority considers that a proposed development would not, by reason of its size, have a significant environmental impact,

a less detailed report might suffice. If an appropriate statement does not accompany the planning application, local authorities should give careful consideration to exercising their powers to require applicants to submit further information relating to the application.

4.5 While wind farm developments as such do not fall within the ambit of EIA, overhead cables, where the voltage would be 200KV or more, are subject to EIA. The majority of wind farms will export electricity via lines which are below 200KV. Cables with boltage below 200KV would only be subject to EIA if the planning authority considers that the development would be likely to have significant effects on the environment.

4.6 In any case local authorities should encourage, where possible, planning applications for any ancillary development to be submitted in conjunction with the main wind farm proposals so that the entire development (windfarm and ancillary development) may be fully assessed in an integrated manner and avoid a situation, for example, where a wind farm is permitted but the connecting powerlines, access roads or other service structures are refused.

Planning applications, ownership and construction of electricity lines are normally the responsibility of the ESB.

Land-use Planning Considerations

4.7 Planning authorities, in considering applications for wind farm developments, should, as in any other case, have regard to the proper planning and development of the area and the preservation and improvement of amenities. The paragraphs following are intended to provide assistance for authorities in identifying the principal considerations. The range of matters dealt with and the guidance given should not, however, be regarded as either exhaustive or definitive.

Visual Impact

4.8 The visual impact is among the more important considerations to be taken into account in arriving at a

decision on a particular application. Wind turbines are tall and their prominence is emphasised by the movement of the rotors. Visual impact must be assessed with their particular and unusual characteristics in mind. Visual impact is influenced by:

- form and characteristics of the landscape;
- design and colour;
- the existing skyline;
- layout of turbines;
- number and size of turbines.

4.9 Assessment of visual impact should have regard to both immediate visual impact and views from a distance (especially from any adjacent areas of high landscape quality). Turbines should not dominate landscape features, especially views designated in the Development Plan as views of special amenity or interest which it is necessary to preserve and views from adjacent areas subject to national or international designation or designated in the Development Plan as being of high landscape quality. Turbines should not be prominent when seen against an elevated skyline background from public roads, towns or village centres. Appropriate techniques to facilitate assessment of visual impact should be adopted, including the provision of photo-montages and, for larger developments or sensitive sites, more sophisticated techniques such as computer graphics.

4.10 Because of the spatial extent of wind energy developments and their potential visual impact, consideration should be given to the issue of intervisibility of sites and to the cumulative impact of developments. In particular, planning authorities should seek to co-ordinate policies, and consult on developments, with neighbouring authorities.

4.11 Softening of the visual impact can be achieved through judicious choice of colour scheme and will depend on the background against which they will be seen. Experience

elsewhere indicates that light grey or white are generally the most suitable colours, with a matt type finish.

4.12 All turbines in a particular development should rotate in the same direction. In general, a visual uniformity should be an objective of the development, i.e., same colour of turbines and number of blades, roughly the same size and proportions and turn at roughly the same rotational speed in a given windspeed. If a proposed development involves turbines which would look significantly different to those on an existing adjacent site, there should be sufficient separation between the two developments to avoid them appearing as a single development. The use of lattice or cylindrical towers should also be considered in the context of visual impact. The transformers for each turbine should be placed inside the supporting tower or otherwise concealed.

4.13 In assessing applications, planning authorities should also have regard to the visual impact of ancillary developments. Service structures and, in particular, roads may have as significant an impact as the wind farm itself, and in certain circumstances a greater impact, particularly in exposed upland sites. Where development is permitted, power lines between the turbines and the windfarm sub-station should be underground. Conditions relating to design (e.g. on the colour of structures or of road surfacing) can also be used to minimise the visual impact. Fencing should be confined to where it is necessary and should be carefully designed for minimum visual impact.

4.14 As the precise location of turbines may need to be modified in the course of development to reflect the actual wind regime, planning authorities may need to consider using planning conditions which would allow a specified degree of flexibility (x metres) in the precise siting of turbines on the site.

Noise

4.15 Another important consideration to be taken into account in arriving at a particular decision on a planning application is noise. Noise may have a more significant

impact in some locations than in others.

There are two sources of noise from wind turbines: the mechanical noise from the turbine and the aerodynamic noise from the blades. The former, like other mechanical sources, can be analysed and reduced by standard engineering practice; details of designs to be used should be sought. The aerodynamic noise depends on the rotor speed, which may be fixed or may increase as wind speed increases. Generally, the background noise from the wind increases at a faster rate than the turbine noise. Consequently, the noise of the turbines relative to background is greatest at low speeds. However, in sheltered positions where "wind shadow" occurs, such as leeward valleys, background noise may remain low when turbines on adjacent higher ground are operating at higher wind speeds.

4.16 Noise impact should be assessed by reference to the nature and character of nearby surroundings and developments. Good acoustical design of turbines and their proper location in relation to noise-sensitive properties is essential in order to ensure that there are no significant increases in ambient noise level at those properties. Generally, noise levels measured externally at any dwellinghouse should not exceed 40dB(A) *leq.* and tonal or impulsive qualities in the noise should be avoided. Planning authorities should ensure agreement with the developers on arrangements for subsequent monitoring.

Noise can also be harmful to wildlife, especially birds. (Under the EU Birds Directive, Member States are obliged to avoid significant disturbance of birds within areas designated as Special Protection Areas.)

Interference

4.17 The possibility of electromagnetic interference with radio or television transmissions or with telecommunications by a proposed wind farm should be assessed. Measures should be taken to avoid interference, including provision to resolve any problems reported when the turbines become operational. Telecom Eireann, RIE and relevant licences

under the Wireless Telegraphy Acts 1926-1988 should be consulted at the earliest possible stage of any proposal as part of that assessment.

4.18 Particular attention should be paid to possible electromagnetic interference with air and sea transport communications. In addition, a wind turbine could, particularly in the vicinity of airports, physically interfere with flight paths. The appropriate authorities (the Irish Aviation Authority, the Department of Defence, the Department of the Marine and the Commissioners of Irish Lights) should be consulted at the earliest possible stage of any proposal. Details of measures to ensure that the development complies with any aeronautical requirements, including location and illumination, should be agreed with the planning authority before development commences. In this connection, planning authorities should also assess the implementation of any requirements relating to painting or lighting of wind turbines insofar as the visual impact of a wind farm is concerned.

4.19 Similarly, measures should be taken to assess, prevent and, if necessary, ameliorate problems of "shadow flicker". This is caused by the rotating shadow of the rotor blades falling on neighbouring properties. At certain times of the day and year, the moving shadow may periodically block light from a room, causing the light to flicker. The extent of this effect may be readily calculated from the geometry of the machine and the layout of the site. For sites where development may be subject to this problem, planning applications should include calculations to quantify the effect.

Ecology, Archaeology Geology and Heritage

4.20 Wind farm development, both during the construction and operational phases, may impact significantly on the ecology, archaeology, geology and heritage of an area. Consultations with the Department of Arts, Culture and the Gaeltacht, the Geological Survey of Ireland, the planning authority and the developers should take place at the earliest possible stage where these matters are relevant.

4.21 Any proposal will require an assessment of the possible ecological impacts. Consideration should be given to sensitive habitats and species, as well as any possible risk to birds, including migratory birds. Wind turbines can be a threat to the safety of bird life. While turbines are normally well below the level of birds' flight paths, they may, in particular circumstances, interfere with flight paths e.g. on migratory routes or near feeding grounds. Birds can be alerted to power distribution/transmission lines by having garragards or coloured balls added to the conductors.

4.22 An assessment of the impact of the development on the known or likely archaeological potential or geological interest of the site should be made, and arrangements made for any necessary investigation. Adequate protection should be afforded to monuments of archaeological interest and to any geological/geomorphological sites proposed or designated for conservation.

4.23 Where appropriate, arrangements should be put in place to ensure monitoring of the site and management of any archaeological, geological or biological finds made during construction. Ecological impacts may, in certain circumstances, be effectively mitigated through suitable phasing of construction work.

4.24 Regard should be had to the status of, and legal obligations arising from, sites and areas subject to national or international designations. Proposals for developments on or adjacent to such areas should be subject to particularly close scrutiny. Such areas include proposed Natural Heritage Areas, National Parks and Gardens, World Heritage Sites, areas or monuments protected under the National Monuments Acts, Ramsar sites, Special Protection Areas designated under the EU Birds Directive No. 409/79/EEC, Special Amenity Areas, and Special Areas for Conservation to be designated under the EU Habitats Directive.

Safety Aspects

4.25 No fencing is required around turbines; people and animals can safely walk right up to the bases of the towers. There is, however, a very remote possibility of injury to

people or animals from flying fragments of ice or of a damaged blade. Experience indicates that properly designed and maintained wind turbines are a safe technology. In any case, the minimum desirable distance between wind turbines and occupied buildings, calculated on the basis of visual impact and expected noise levels, will always be greater than that necessary to meet safety requirements.

4.26 Adequate clearance between structures and overhead power lines, as specified by the electricity undertaker, should be provided. It should be noted that there is a statutory obligation to notify the ESB of proposed developments within 25 yards of any ESB distribution/transmission line. The likely visual and other impacts of security measures should also be appraised.

4.27 The height and movement of wind turbines may distract drivers of motor vehicles. A prudent approach should therefore be taken to the siting of turbines near roads with a bad accident record or carrying significant levels of traffic. Accordingly, a setback from the road will generally be advisable. Such a setback may need to be up to 300m, depending on the circumstances.

Other Land Uses

4.28 In general, wind farms will not normally conflict directly with other extensive rural land uses. Livestock can graze safely around wind turbines and most farming activities can be carried on in the vicinity of wind farms without problems.

4.29 Where the quality of the local environment and landscape contribute significantly to activities which support the local economy, such as tourism and outdoor recreational activities, that contribution is relevant to the proper planning and development of the area and should be considered as part of the planning process. In particular, the possible noise or visual impact of the development on such activities should be assessed.

4.30 Rural land uses, other than housing, are generally

unlikely to conflict with wind farm developments. However, wind turbines do require an adequate "fetch" for the wind to maintain an adequate wind energy resource. Mature long rotation forests can grow to a height of 30m. Long rotation forestry in the vicinity may, therefore, be in conflict by reason of the shelter it provides. The location of turbines in or adjacent to a long rotation forest may also be inappropriate because trees may have to be cut out to give clearance and power lines and other associated developments could interfere further. The Forest Service of the Department of Agriculture, Food and Forestry and Coillte should therefore be consulted on relevant proposals.

4.31 Noise and other factors render housing more sensitive to wind energy developments. At normal spacing between turbines (see paragraph 2.2), noise considerations would suggest that nobody should live permanently inside a wind farm. Potential impacts on adjacent housing or residential land allocations should also be taken into consideration (see paragraph 4.16).

Construction Impacts

4.32 The likely impacts of construction traffic on public safety, the structural and traffic capacity of access roads and local amenity should be assessed by developers and considered by planning authorities. The drainage implications of the development, particularly during construction, should also be considered.

Conditions

4.33 Appropriate conditions in permissions can help mitigate any detrimental effects. Such conditions could require: limits on noise levels; measures to reduce visual impact; measures to prevent interference; details of traffic movements (including the routing of construction/decommissioning traffic, if appropriate, to avoid unsuitable routes); contributions towards road or other works required; and measures to minimise construction/decommissioning impacts (e.g. phasing or timing of works) and to ensure site reinstatement after construction/

decommissioning work is finished.

4.34 Planning authorities should ensure that arrangements for monitoring interference etc., at wind farms are incorporated in planning permissions. The monitoring data can be used in initiating measures to mitigate undesirable effects, and also to inform future decision making.

4.35 Conditions will generally be required to provide for decommissioning of wind farms and ancillary developments and site reinstatement, following the end of their useful lives. Planning authorities should also consider conditions to ensure decommissioning/site reinstatement where the wind farm fails, for whatever reason, to produce electricity over a continuous period of time or for any other reason falls into disuse.

Planning authorities should consider a bonding arrangement to ensure the proper decommissioning and site reinstatement of wind farms and ancillary developments.

Site Assessment Developments

4.36 Where developers wish to install wind measurement masts and carry out wind resource analyses, planning authorities should facilitate them, wherever possible, by granting temporary planning permission, for up to 2 years. However, it would be helpful to all concerned for a planning authority to advise a developer at that stage if they have any strong reservations regarding the suitability of the site in question for a wind farm, so that a developer can decide whether or not to proceed with the assessment.

4.37 A temporary planning permission cannot be seen as prejudicing consideration of any subsequent proposal for a windfarm. In addition to advising developers of any strong reservations they may have on a particular site, the planning authority should give advice on those factors which would be of importance in assessing any future proposal for a commercial wind farm.

Appendix 1

List of Relevant Publications

IRELAND - Climate Change: CO2 Abatement Strategy;
Stationery Office, Dublin, 1993

IRELAND: National Development Plan, 1994-99; Stationery
Office, Dublin, 1993

Programme for a Government of Renewal

Alternative Energy Requirement: Information Notes for
Generators;

Electricity Supply Board, Dublin, 1994

Wind Energy Development: Best Practice Guidelines; Irish
Wind Energy Association, Arigna, 1994

Development Control Advice and Guidelines; Department of
the Environment, Dublin, 1982

Code of Practice for Survey, Construction and Maintenance
of Overhead Lines; IFA/ESB, Dublin, 1985

Identification of Wind Energy-Rich Sites best suited for Wind
Energy Development; Department of Transport, Energy and
Communications, Dublin, 1989

Inventories of Environmental Impact Statements submitted to
the Department of the Environment. Years 1989 - 1993
available. Department of the Environment, Dublin, 1992,
1993, 1994, 1995

Agreement on Compensation for Loss of Tree Planting
Rights: IFA/ESB, 1992

International Publications:

"Towards Sustainability": Commission of the European
Communities, Brussels, 1992

ALTENER - Community Action Programme for the period
1993-1997; Commission of the European Communities,

Brussels, 1993 (available from Department of Transport,
Energy and Communications, Dublin)

Planning Policy Guidance Note PPG22: Renewable Energy;
Welsh Office/Department of the Environment, Cardiff and
London, 1993

National Planning Policy Guideline NPPG 6: Renewable
Energy; Scottish Office, Edinburgh, 1994

Planning Advice Note PAN 45: Renewable Energy
Technologies; Scottish Office, Edinburgh, 1994

House of Commons Welsh Affairs Committee: Wind Energy,
Volume One; London, 1994

United Kingdom Development Plans:
Glynŵr District Council, Clwyd, Wales
Shropshire County Council, England