

Environment Policy Development Group - 30 June 2010**WIND TURBINES****Report of Head of Development Management and Head of Environmental Health**

Statutory Powers: Planning and Compensation Act.

Financial Implications: There are no financial implications raised by this report, but if Members wish Supplementary Planning Guidance (SPD) to be prepared on wind turbines this is likely to affect the production of other policies.

Purpose: To advise the EPDG on the policy position for wind turbines and the issues they raise for the Local Planning Authority. This issue relates to Council priority CP3 - Maintain the distinctive environment.

RECOMMENDATIONS

That the Environment Policy Development Group RESOLVES that further supplementary guidance, particularly relating to wind turbines, is not necessary at this stage as each application is site specific, and is decided on its own merits.

Background/The Issues

1. Members have requested that a report be prepared on wind turbines. It is assumed that this be so that the need for supplementary planning guidance can be considered.

Definition

2. There are essentially two types of wind turbine, and they look very different—vertical axis machines with rotors that rotate about a vertical axis, and horizontal axis machines whose rotating shafts are aligned horizontally. Most wind turbines installed today are of the horizontal axis type, though there have been some vertical axis ones installed at the Sainsbury supermarket in Dartmouth. The predominance of the horizontal axis sort is likely to remain the case for the foreseeable future, according to Government advice. Wind turbines use the wind to generate mechanical power for water pumping or for electricity generation. This report deals only with the electricity-producing variety. Such wind turbines convert the kinetic energy of the wind that passes through the swept area of the rotor into electrical energy by means of a rotor (generally comprising 3 blades), a mechanical drive train (usually including a gearbox) and an electrical generator. These are all mounted on a tower. The height of the tower is normally at least twice the length of a blade. The blades need to be far enough from the ground to minimise turbulence and to maximise the energy capture of the wind turbine. Normally solid tubular towers are used rather than lattice constructed towers.

3. Wind turbines are defined by the size (diameter) of the rotor and rated power or capacity in kilowatts (kW) or megawatts (MW). The rated capacity of a wind turbine is a measure of the maximum output of the electricity generator which will generally be achieved in wind speeds greater than 12-15m/s at the hub height of the rotor. There are two things worth noting:
 - an increase in the rotor diameter of a wind turbine will result in a greater than proportional change in rated power;
 - an increase in wind speed will result in a greater than proportional change in rated power. Rated power is proportional to the cube of the wind speed, and hence a doubling of wind speed will result in a roughly eight-fold increase in power output.
4. The observations above relate to the fundamental physical principals behind wind turbine technology. They are, however, somewhat modified by the requirement to maximise efficient energy capture across a range of wind conditions.
5. Wind turbines are available in a wide range of sizes, from small battery charging units with rotor diameters of less than a metre to very large wind turbines with rotor diameters greater than 100 metres with a capacity of several megawatts. Wind turbines have increased in size and capacity over time and will continue to do so in the foreseeable future, although it should not automatically be assumed that the largest turbines will feature in planning applications for onshore locations. The choice of turbine size depends on the site chosen and the scale of development required. Commercial wind farms that supply electricity to the electricity grid tend to use a smaller number of larger machines. However, farms and businesses using wind power might size their turbines according to the size of their own electricity demand.
6. Modern wind turbines also continuously monitor their own performance and if atypical vibrations caused by component imbalances are detected, or if connection to the local electricity grid infrastructure is lost, all turbines must be capable of emergency stops. Most modern wind turbines undergo test certification procedures, which must conform to the guidelines laid down by the International Electro-technical Commission (IEC).
7. Wind turbines need to be positioned so that the distances between them are around 3-10 rotor diameters (about 180-600 metres for a wind farm using 60m diameter, 1.3MW wind turbines). This spacing represents a compromise between compactness, which minimises capital cost, and the need for adequate separations to lessen energy loss through wind shadowing from upstream machines. The required spacing will often be dependent on the prevailing wind direction.
8. The energy produced by a wind turbine depends on the strength of the wind to which it is exposed. The simplest indicator of the wind resource available at a given location is the annual mean wind speed at the site (usually given at the hub height of the turbine). A machine located on a site which has an annual mean wind speed of 6 metres per second will typically produce only half as much energy as the same machine on a site where the annual wind speed is 8 metres per second.

Need for permission

9. Most wind turbines require planning permission, though there has been recent consultation on proposed amendments to the GPDO to make some of the smaller ones permitted development.
10. A wind turbine development of 50MW or less installed capacity¹ will need planning permission granted by the local planning authority under the Town and Country Planning Act 1990.
11. A wind turbine development of over 50 MW capacity will be considered by the Secretary for State for Energy, under Section 36 of the Electricity Act 1989, and the local planning authority will be a statutory consultee
12. Although in the past most wind farm development tended to be located in upland areas due to higher wind speeds, technological advances, and changes to the renewable electricity markets have resulted in wind speed being less pivotal in the site selection process. Generally, whether there is a reasonable prospect of obtaining planning permission is becoming a much more dominant factor in the initial site selection process

Planning policy

13. Government policy on all forms of renewable energy is set out in PPS 22 (2004), though this does not cover offshore installations or combined heat and power (CHP) plants.
14. The target at that time the guidance was prepared was to cut carbon dioxide emissions by 60% by 2050, and to assist in this, 10% of electricity generation was due to be by renewable energy by this year. The UK is considered to have the largest potential wind energy resource in Europe. In 2004 DTI said that wind power generated electricity provided power for over 390,000 households and its use prevented the annual emission of over 1.46 million tonnes of carbon dioxide.
15. The planning system was therefore tasked with facilitating the delivery of appropriate wind energy developments. Policies have consequently emerged in the RSS and County Structure Plan. These concentrate on strategic targets, and the overall level of electricity output in the sub region, and so address the large scale and primarily commercial wind farm proposals. **Policy CO12** of the Structure Plan identifies the Devon sub-regional target as being 151 MW of electricity production from renewable sources by this year. It identified the principle area of search for windfarm sites as within the centre of the County. This Council's Core Strategy **policy CS11** requires that 10% of a scheme's energy requirement be provided through on site renewable sources. Draft DC **policy DP4** includes a number of measures to address sustainable construction matters. It includes a requirement that: "Development will be expected to incorporate appropriate renewable energy measures".
16. PPS 22 acknowledges though that small scale projects can provide a limited but valuable contribution. It counsels that LPAs should not reject applications just because the level of output is small.

It also says that LPAs may include policies in LDF documents, which require a percentage of the energy to be used in new developments to come from on-site renewable sources where it is viable to do so.

17. The clear principle is that appropriate developments should include a proportion of on site renewable energy production and that those schemes, which provide new sources of renewable energy should be encouraged, providing this is balanced against the environmental impacts.

Issues

18. There are a number of issues specific to wind turbine developments that need to be considered when determining an application for planning permission. These issues will vary according to the scale of the scheme. Where an Environmental Impact Assessment (EIA) is deemed necessary, the potential issues should be covered in the Environmental Statement but, for smaller developments that do not require a full EIA, the local planning authority may require some or all of the issues to be addressed, forming Additional Environmental Information or an Environmental Report, to accompany a planning application.
19. The main issues, which arise in relation to wind turbines are visual impact, residential amenity, noise, safety, and ecology.

Visual impact

20. The government notes the sensitivity of nationally designated areas like National Parks, AONBs and Heritage Coasts, and suggests that renewable energy developments are allowed there only where this is consistent with the purposes of their designation, which is to protect landscape character and natural landscape. This does not mean that wind turbines can not be placed within such designations, it just means that the quality of landscape impact assessment needs to be particularly robust.
21. Special care will be needed if proposed sites for wind turbines should happen to be near listed buildings or conservation areas. PPG15 gives advice about the conservation aspects of planning control.

Noise

22. Well-specified and well-designed wind farms should be located so that increases in ambient noise levels around noise-sensitive developments are kept to acceptable levels with relation to existing background noise. This will normally be achieved through good design of the turbines and through allowing sufficient distance between the turbines and any existing noise-sensitive development so that noise from the turbines will not normally be significant. Noise levels from turbines are generally low and, under most operating conditions, it is likely that turbine noise would be completely masked by wind-generated background noise. Table 1 below indicates the noise generated by wind turbines, compared with other every-day activities.

Table 1 Noise generated by wind turbines compared with other everyday activities	
Source/Activity	Indicative Noise Level dB(A)
Threshold of Pain	140
Jet aircraft at 250 m	105
Pneumatic drill at 7 m	95
Truck at 30 mph at 100 m	65
Busy general office	60
Car at 40 mph at 100 m	55
Wind farm at 350 m	35–45
Quiet bedroom	20
Rural night-time background	20–40
Threshold of hearing	0

23. There are two quite distinct types of noise source within a wind turbine. The mechanical noise produced by the gearbox, generator and other parts of the drive train; and the aerodynamic noise produced by the passage of the blades through the air. Since the early 1990s, there has been a significant reduction in the mechanical noise generated by wind turbines and it is now usually less than, or of a similar level to, the aerodynamic noise. Aerodynamic noise from wind turbines is generally unobtrusive – it is broadband in nature and in this respect is similar to, for example, the noise of wind in trees.

24. Wind-generated background noise increases with wind speed, and at a faster rate than the wind turbine noise increases with wind speed. The difference between the noise of the wind farm and the background noise is therefore liable to be greatest at low wind speeds. Varying the speed of the turbines in such conditions can, if necessary, reduce the sound output from modern turbines.

25. The Environmental Health Department is a statutory consultee in relation to noise issues arising from planning applications for small scale wind turbines. When commenting on applications the Environmental Health Department may make reference to various guidance and/or standards.

26. The companion guide to PPS 22 refers to a report, '**The Assessment and Rating of Noise from Wind Farms' (ETSU-R-97)**, which describes a framework for the measurement of wind farm noise and gives indicative noise levels calculated to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable restrictions on wind farm development or adding unduly to the costs and administrative burdens on wind farm developers or planning authorities. The report presents the findings of a cross-interest Noise Working Group and makes a series of recommendations that may be regarded as relevant guidance on good practice.

This methodology overcomes some of the disadvantages of BS 4142 when assessing the noise effects of wind farms, and should be used by planning authorities when assessing and rating noise from wind energy developments (PPS22, paragraph 22). However, the report was written in 1997 when considering larger wind turbines and there is an opinion that it may be considered inappropriate when considering modern small scale turbines.

27. A current applicable noise standard is **British Standard 4142** where it states that if the noise rating level of the unit (when assessed as per the standard) is no more than 5 dB above the background at the nearest noise sensitive premises there are unlikely to be complaints about the noise.

28. There are other standards and limits that could be applied and are listed as follows:

- **British Standard 8233** this states that 30 db LAeq inside bedrooms is a "good" standard, meaning that an external noise level at the facade of the neighbouring building of 40dB LAeq is the limit of acceptability.
- **Planning Policy Guidance 24** 45 dB LAeq as measured 1 metre from the facade of the affected property is acceptable.
- **World Health Organisation** 45 dB LAeq as measured 1 metre from the facade of the affected property is acceptable.

29. The issues arising from this are:

- Noise from the wind turbine may still give rise to complaint even if it complies with the guidance. Indeed, it may comply with one standard but not another.
- There is no definitive standard for the noise impact of a small scale wind turbine and the various items of guidance available (listed above) are not always appropriate to small scale developments.

30. The Government have released a consultation document called "Permitted development rights for small scale renewable and low carbon energy technologies, and electric vehicle charging infrastructure"

31. The Government proposes in its consultation document the following noise limit:

"The noise level from the installation must not exceed 45 dB LAeq, 5 min at 1 metre from the window of a habitable room in the façade of any neighbouring residential property (but ignoring the effect of that façade)."

The results of the consultation process are yet to be published and it is not known at present when the permitted development rights to include small scale wind turbines are likely to be introduced.

Safety

32. The companion guide says that experience indicates that properly designed and maintained wind turbines are a safe technology. The very few accidents that have occurred involving injury to humans have been caused by failure to observe manufacturers' and operators' instructions for the operation of the machines. There has been no example of injury to a member of the public. The only source of possible danger to human or animal life from a wind turbine would be the loss of a piece of the blade or, in most exceptional circumstances, of the whole blade. Many blades are composite structures with no bolts or other separate components. Blade failure is therefore most unlikely. Even for blades with separate control surfaces on or comprising the tips of the blade, separation is most unlikely.
33. The minimum desirable distance between wind turbines and occupied buildings calculated on the basis of expected noise levels and visual impact will often be greater than that necessary to meet safety requirements. Fall over distance (i.e. the height of the turbine to the tip of the blade) plus 10% is often used as a safe separation distance.
34. Concern is often expressed over the effects of wind turbines on car drivers, who may be distracted by the turbines and the movement of the blades. Drivers are faced with a number of varied and competing distractions during any normal journey, including advertising hoardings, which are deliberately designed to attract attention. At all times drivers are required to take reasonable care to ensure their own and others' safety. Wind turbines should therefore not be treated any differently from other distractions a driver must face and should not be considered particularly hazardous. There are now a large number of wind farms adjoining or close to road networks and there has been no history of accidents at any of them.

Ecology

35. PPG9 on nature conservation gives advice about the inter-relationship between nature conservation and development control. Apart from the movement of the blades, the development of wind turbines warrants no different approach in terms of ecological considerations from any other development. Applications to harness wind energy may be made in areas designated as of ecological importance, and such applications should be rigorously examined. Evidence suggests that the risk of collision between moving turbine blades and birds is minimal both for migrating birds and for local habitats. The attention of local planning authorities and developers is particularly drawn to the Ramsar Convention on Wetlands of International Importance (Cmnd 6465), EC Council Directive on the Conservation of Wild Birds (Directive 79/409/EEC), the EC Council Directive on the conservation of natural habitats and of wild fauna and flora (92/43/EEC) and the Berne Convention on the Conservation of European Wildlife and Natural Habitats.
36. Experience indicates that bird species and their habitats are rarely affected by wind turbine developments and the impact of an appropriately designed and located wind farm on the local bird life should, in many cases, be minimal. To date, the most common concern has been the risk of 'bird strike' i.e. birds flying through the area swept by the blades and being hit, causing injury or death.

This is most likely to occur if a wind turbine is erected directly in a migration path, or where there are high concentrations of particular species (i.e birds feeding). Most birds in flight can be expected to take action to avoid obstacles but different species will vary in their reaction. However, some areas are important for a variety of bird species protected under the EU and UK legislation (SPAs, SACs and SSSIs). These could represent potential constraints to wind farm development. As indicated in PPG 9 on nature conservation, the importance of complying with international and national conservation obligations must be recognised and wind farms should not adversely affect the integrity of designated sites. Protected species, such as eagles and hen harriers, occupy many areas outside designated sites and are protected across England. These factors have to be considered against the positioning and size of turbines, including the size of the area swept by the blades in relation to the air space used by the birds in the vicinity of the turbine. Within South Hams, the impact on bats is an important consideration, and applications for even small turbines are likely to need to have an ecological impact assessment on bats.

Shadow Flicker

37. Under certain combinations of geographical position and time of day, the sun may pass behind the rotors of a wind turbine and cast a shadow over neighbouring properties. When the blades rotate, the shadow flicks on and off; the effect is known as 'shadow flicker'. It only occurs inside buildings where the flicker appears through a narrow window opening. The seasonal duration of this effect can be calculated from the geometry of the machine and the latitude of the site. Although problems caused by shadow flicker are rare, for sites where existing development may be subject to this problem, applicants for planning permission for wind turbine installations should provide an analysis to quantify the effect. A single window in a single building is likely to be affected for a few minutes at certain times of the day during short periods of the year.
38. Shadow flicker can be mitigated by siting wind turbines at sufficient distance from residences likely to be affected. Flicker effects have been proven to occur only within ten rotor diameters of a turbine. Therefore if the turbine has 80m diameter blades, the potential shadow flicker effect could be felt up to 800m from a turbine.
39. Around 0.5 % of the population is epileptic and of these around 5% are photo-sensitive. Of photo-sensitive epileptics, less than 5% are sensitive to lowest frequencies of 2.5-3 Hz, the remainder are sensitive only to higher frequencies. The flicker caused by wind turbines is equal to the blade passing frequency. A fast-moving three-bladed machine will give rise to the highest levels of flicker frequency. These levels are well below 2 Hz. The new generation of wind turbines is known to operate at levels below 1 Hz.

Residential amenity

40. The impacts on residential amenity tend to concentrate on the above issues.

Need for local guidance

41. The issues raised by any particular wind turbine tend to be very site specific, and so any generic guidance may not be very helpful. However should the Group wish to pursue supplementary guidance, then the most fruitful area probably lies in the provision of information about:
- the range of information that needs to be made available by the applicant at pre-app or application stage. This would need to cover visual, noise and ecological impacts as a minimum;
 - the relevant policies;
 - the best way to involve local communities.
42. Officers will continue to seek out examples of supplementary guidance that has been produced elsewhere to assist the discussion. However, the recent one which has been prepared by South Northamptonshire Council is attached for Members of the Group, and available for other Members by request from Member Support Services.

Risk Assessment

43. The following are the significant risks and opportunities identified:

Opportunity	Issues / Obstacles	Benefits
The Council has no current guidance on renewable energy production. Nevertheless, there is continuing interest in solar and wind powered electricity generation within the district. Such guidance would help applicants and the community understand the issues involved.	One obstacle to producing guidance is that it is not currently programmed within the LDF, and so would create a conflict of priorities. A further obstacle is that each application is site specific and generic guidance would not be helpful	Help ensure:- <ul style="list-style-type: none">• Community engagement;• Understanding of issues;• Well considered proposals.

Conclusion

44. Planning policy positively supports the introduction of wind turbines. Nevertheless, they can be very contentious locally. The Goveton wind farm scheme and complaints about some small non-commercial schemes are testimony to this. There may be some benefits to having supplementary planning guidance, but this should be extended to address other renewable energy production in order to maximise its benefits.

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30 June 2010

Background Documents:

PPS 22
SWRSS
SHDC Core Strategy and draft DC policies.