

Wind Turbine Risk

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Introduction

The Government has very little to say about the safety of wind turbines and the risks they pose to people. The Companion Guide to PPS22 (Planning Policy Statement 22: Renewable Energy) has only this to say about the safety of onshore wind turbines:

“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.

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.”

This article examines whether wind turbines are a “safe technology” and discusses the risks they pose to people.

Risk and its regulation

All activities carry a risk and there is no guarantee of absolute safety. Risk may be defined as the product of the probability of an event occurring and the consequences of the event. Thus for example, an activity with a high probability of occurrence, the consequence of which is death, is a high risk activity. An activity with a low probability of occurrence, the consequence of which is a minor injury, is a low risk activity.

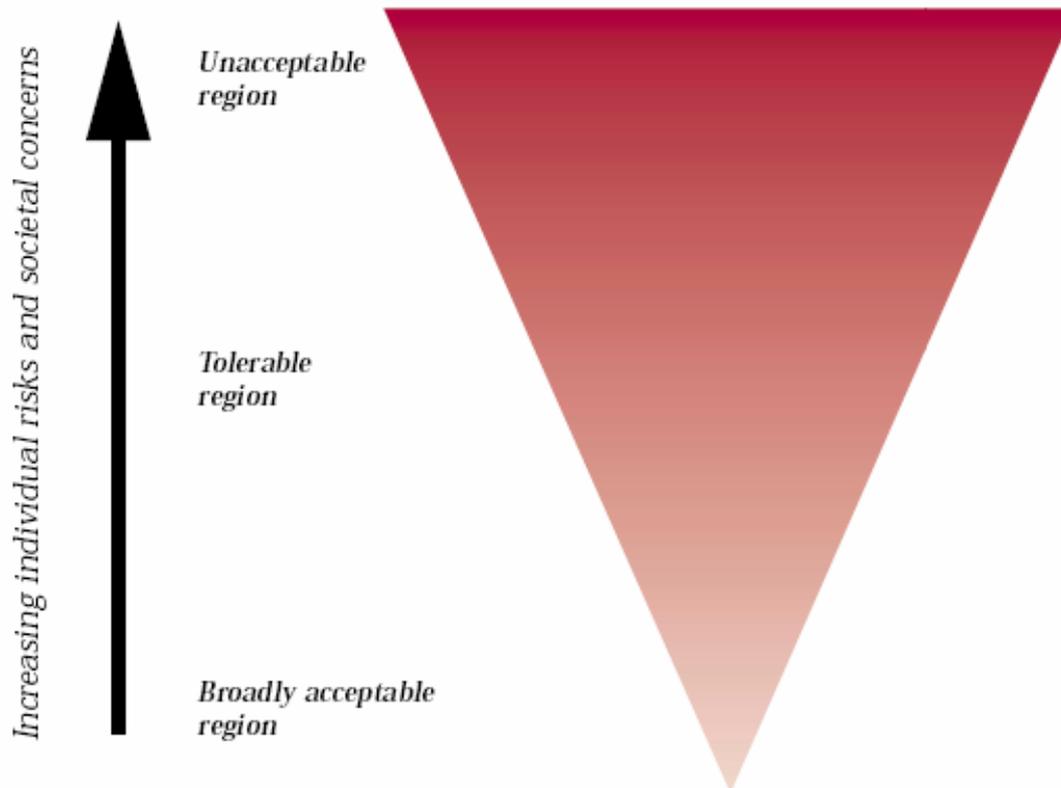
Under the Town and Country Planning (Environmental Impact Assessment) Regulations 2011, a turbine is a Schedule 2 installation under the energy industry category (i) which covers “Installations for the harnessing of wind power for energy production (wind farms) if (i) The development involves the installation of more than 2 turbines; or (ii) the hub height of any turbine or height of any other structure exceeds 15 metres”. For Schedule 2 developments, Schedule 3 Regulation 4(6) states that “The characteristics of development must be considered having regard, in particular, to (f) the risk of accidents, having regard in particular to substances or technologies used”. If a turbine is over 15m tall, it is a Schedule 2 installation under the energy industry category (i) and therefore the risks of accidents must be considered.

The Health and Safety at Work Act 1974 applies to all work activities in Great Britain, including land based wind turbines. The act states that “It shall be the duty of every employer to conduct his undertaking in such a way as to ensure, so far as is reasonably practicable, that **persons not in his employment** who may be affected thereby are not thereby exposed to risks to their health or safety”.

The Management of Health and Safety at Work Regulations 1999 state “Every employer shall make a suitable and sufficient assessment of the risks to the health and safety of persons not in his employment arising out of or in connection with the conduct by him of his undertaking”.

The Health and Safety Executive (HSE) favours a risk-based approach to safety and emphasises the role of risk assessment, both quantitative and qualitative, in the decision-making process and in determining the control measures that must be put in place for addressing hazards (‘Reducing risks, protecting people’ (R2P2)¹). In R2P2 the HSE defines three regions of risk: broadly acceptable, tolerable and unacceptable. These are shown in the diagram below.

¹ <http://www.hse.gov.uk/risk/theory/r2p2.pdf>



R2P2 states *“The triangle represents increasing level of ‘risk’ for a particular hazardous activity (measured by the individual risk and societal concerns it engenders) as we move from the bottom of the triangle towards the top. The dark zone at the top represents an unacceptable region. For practical purposes, a particular risk falling into that region is regarded as unacceptable whatever the level of benefits associated with the activity. Any activity or practice giving rise to risks falling in that region would, as a matter of principle, be ruled out unless the activity or practice can be modified to reduce the degree of risk so that it falls in one of the regions below, or there are exceptional reasons for the activity or practice to be retained.*

Regarding unacceptable risk it states *“we believe that there are risks that society regards as unacceptable because they entail too high a likelihood that harm will actually occur to those exposed or the consequences are too extreme, however small the likelihood of the risk being realised, to countenance exposure to the hazard”.* The risks to the public arising from wind turbines must be determined and be shown to be acceptable or tolerable, be as low as reasonably practicable (ALARP) and be maintained ALARP.

In its submission to the Government's energy review in 2006, entitled "The Health and Safety Risks and Regulatory Strategy Related to Energy Developments"², the HSE stated under the heading "Risks to the public" that for onshore wind power "Wind turbines are frequently located on land open to the public and so account needs to be taken of hazards such as whole or partial blade failure, falling ice, fire and lightning".

This requirement was reinforced in a presentation to the BWEA30 conference in 2008 where the HSE position on risks to the public was made clear in a session on Health & Safety³:

Onshore Wind Power – Risks to the public



- Turbines frequently located on land open to the public; so account needs to be taken of hazards such as:
 - turbine collapse;
 - component shedding/blade failure;
 - ice throw;
 - fire;
 - lightning.
- When developer seeks planning permission for a wind farm, potential risks to public safety should be assessed within the planning framework process.

RenewableUK (BWEA) has produced guidelines for health and safety in the wind energy industry⁴. The guidelines state at section 7.3 that "This section focuses on the need to ensure that potential risks to non industry personnel e.g. members of the public, are addressed throughout the life phases of projects and that residual risks are acceptable when compared with people's expectation of day to day risk exposure". The guidelines also state that "The project development process

² <http://www.hse.gov.uk/consult/condocs/energyreview/energyreport.pdf>

³ <http://www.taplondon.co.uk/bwea30/pdf/nicksummers-web.pdf>

⁴ <http://www.bwea.com/pdf/HSGuidelines.pdf>

requires identification of hazards and management of risks to public safety. Risk assessments shall combine consideration of the hazard presented by the specific installation/location (taking due account of all risk control measures) and the nature and frequency of public exposure. The process must provide assurance that the risks from the proximity and layout of turbines in relation to areas used by the public are acceptable”.

It is clear from the legislation and from statements from the HSE and RenewableUK, that risks to the public should be addressed within the planning framework and the risks should be shown to be broadly acceptable or tolerable and ALARP.

The HSE is quite clear that the siting of wind turbines is a matter for Local Planning Authorities (LPAs) to decide, working to a planning regime overseen by the Department for Communities and Local Government (DCLG). Paragraph 25 of the Planning Policy Statement 22 (PPS22) confirms that it is the responsibility of developers to address any potential impacts before planning applications are submitted and that LPAs should satisfy themselves such issues have been addressed before considering planning applications. The HSE deals with Health and safety in the workplace, only during construction and operation. It has no involvement in planning or prior to start of construction.

It is therefore the duty of the owner of a wind turbine to demonstrate that the risks from operation of the wind turbine are broadly acceptable or tolerable and ALARP and will remain ALARP throughout the lifetime of the turbine. It is the duty of the LPA to ensure that the issues have been addressed before determining planning applications for wind turbines. As the ultimate arbiter of what is acceptable from the point of view of safety of the public, the LPA and its planning department has a duty of care to the public which they must rigorously enforce. This is particularly important where vulnerable people are involved.

The control of the risks posed by wind turbines

Because the wind power industry is unregulated, the wind industry has grown without having to adhere to any specific enforceable standards. Responsibility for ensuring public safety is currently shared between DCLG and the Local Planning

Authorities (LPAs). Confusion exists on exactly how these responsibilities are shared. This lack of clarity endangers the public, especially as there are no formal restrictions to prevent wind turbines from being located close to schools, hospitals, domestic dwellings or public roads. As the prime approval body in the planning process, responsibility is forced onto the LPA. Currently, LPAs do not enforce the requirements specified by the HSE and do not require developers of turbines to follow the RenewableUK guidelines. Furthermore, LPAs do not have the expertise to assess the risks posed by wind turbines. The H&S officers in LPAs seem to be solely concerned with the health and safety of their employees and members of the public when on council-owned property.

However, LPAs have a conflict of interest. They are the approval authority in the planning process, but they are also under financial and political pressures to install wind turbines on council property⁵.

If an application is refused by the LPA and the decision is appealed, the Planning Inspectorate determines the decision, following written submissions, a hearing or a Public Inquiry. In that case, the decision is made by an Inspector, and the consideration of risk to the public is usually totally ignored as Inspectors also do not have the expertise to assess the risks, which they assume has been adequately addressed by the LPA.

Indeed in the Inspector's Appeal Decision at the Den Brook Public Inquiry⁶, under the heading "Safety" the Inspector relied on the Companion Guide to PPS22 and stated "*Evidence submitted refers to the potential for wind turbines to present a source of high risk to the public*". "*The technology itself is fairly simple, and this in itself must reduce the risk of accidents*". "*The Companion Guide to PPS22 records that maximum safety can be achieved by ensuring the turbines are set-back from roads and railways by at least fall over distance. I understand however that two of the proposed turbines would be within 100m and 90m respectively of the railway line which crosses the appeal site. However, in my **view** the likelihood of a collapse is*

⁵ <http://www.telegraph.co.uk/earth/earthnews/7932889/Solar-panels-and-wind-turbines-to-be-installed-on-schools-and-hospitals.html>

⁶

<http://www.pcs.planningportal.gov.uk/pcsportal/fscdav/READONLY?OBJ=COO.2036.300.12.1518278&NAME=/2017162%20APPEAL%20DECISION.pdf>

extremely remote". [emphasis added. Note the turbines are 120m to tip and so the two turbines are well within fall over distance of the railway]. It is clear that the Inspector has demonstrated a complete lack of understanding of risk, allowing his "*view*" to over-turn the evidence. Furthermore, since Appeal Decisions are used as precedents for future wind turbine applications, his decision is an encouragement to wind turbine developers to continue to ignore HSE and RenewableUK guidance on addressing risk and to ignore Government guidance on turbine siting which is intended to protect public safety.

Statistics on wind turbine accidents

The Caithness Wind Farm Information Forum maintains up-to-date information on wind turbine accidents taken from press reports or official information releases⁷. The statistics to the end of 2011 are shown below.

Total number of accidents: 1142

Year	70s	80s	90-94	95-99	00	01	02	03	04	05	06	07	08	09	10	11
No.	1	9	17	81	30	17	70	66	59	71	82	124	130	129	112	144

Blade failure:

By far the biggest number of incidents found were due to blade failure. Blade failure can arise from a number of possible sources and results in either whole blades or pieces of blade being thrown from the turbine. A total of 221 incidences were found. Pieces of blade are documented travelling up to 1300m.

Year	70s	80s	90-94	95-99	00	01	02	03	04	05	06	07	08	09	10	11
No.			3	32	4	6	15	13	15	12	16	22	20	26	20	17

Fire:

Year	70s	80s	90-94	95-99	00	01	02	03	04	05	06	07	08	09	10	11
No.			1	5	3	2	24	17	15	14	12	21	17	16	9	12

Structural failure:

⁷ <http://www.caithnesswindfarms.co.uk/accidents.pdf>

Year	70s	80s	90-94	95-99	00	01	02	03	04	05	06	07	08	09	10	11
No.		1	1	13	9	3	9	7	4	7	9	13	9	16	9	11

The above list of hazards is not exhaustive, for example it does not include ice throw and lightning damage, two additional hazards identified by HSE. The rate of occurrence of accidents is generally increasing, reflecting the increased number of installed turbines. However the accident frequency rate is not known.

What is clear from these statistics is that wind turbines present a real hazard and that there is a real risk to the public if turbines are located close to public activities.

If the risk to the public is to be in the broadly acceptable region and ALARP, then the risks associated with each wind turbine should be a prime consideration in the siting of turbines. This is particularly important if industrial size wind turbines are proposed in locations where there is public access.

Wind turbines contain rapidly rotating blades. In an industrial location, such machinery would, whilst operating, be protected by an enclosure (such as a wire-mesh cage) to prevent workers coming into contact with the rotating parts and to contain debris in the event of component failure.

Siting of wind turbines

There has been, and remains, a desire by many public bodies to site industrial size wind turbines in public places such as schools and hospitals and for communities to site industrial size wind turbines in recreational areas. Of greatest concern to safety, is siting of turbines in school grounds. There have been several incidents (known in industry as “near misses”) concerning school wind turbines.

Examples are given below.

In December 2009 at the Gorran School in Cornwall, two blades were thrown from the 15m tall turbine in the playing field when the brakes failed. Fortunately the incident occurred in the early hours of a Saturday morning and nobody was injured⁸.

⁸ <http://www.newquayvoice.co.uk/news/0/article/2859/>

In November 2009 at the Raasay Primary School in Scotland, a 50ft turbine collapsed in the school playground. Nobody was injured. The turbine had been installed by the Highland Council with a Scottish Government grant. Prior to collapse, complaints had been made about turbine noise⁹.

In December 2009 at the Fakenham High School in Norfolk, a 40ft wind turbine collapsed onto the school playing field as it was being installed. Nobody was injured¹⁰.

In July 2010, a 30ft wind turbine was turned off at the Southwell Community Primary School in Norfolk Portland School after the blades, which rotate at up to 135mph, had struck at least 14 birds in six months. The pupils were upset when deaths occurred during playtimes and lunchtimes.

Based on the HSE view given above of what constitutes unacceptable risk, namely, *“we believe that there are risks that society regards as unacceptable because they entail too high a likelihood that harm will actually occur to those exposed or the consequences are too extreme, however small the likelihood of the risk being realised, to countenance exposure to the hazard”*, it is argued that the consequences of wind turbine failure in public locations, such as in school or hospital grounds, are *“too extreme”* and thus, even though the likelihood may be low, the risk is unacceptable.

Conclusions

It is concluded that with regard to planning applications for wind turbines:

- Wind turbines are not a “safe technology” and, if badly sited, they pose a risk to people.
- Developers are not assessing risks to public safety within the planning process.
- LPAs are not carrying out their duty of care by ensuring that developers carry out a risk assessment of their proposal.

⁹ <http://www.pressandjournal.co.uk/Article.aspx/1492247?UserKey>

¹⁰ <http://www.dailymail.co.uk/news/article-1232540/School-wind-turbine-collapses-crushes-contractors-van.html>

- LPAs are not carrying out their duty-of-care to the public by ensuring that the risk posed by wind turbines is broadly acceptable or tolerable.
- LPAs have a conflict-of-interest with regard to wind turbines.
- The wind industry should be regulated.
- Wind turbines should not be sited at schools since they pose an unacceptable risk.
- Wind turbines should not be sited in hospital grounds and in other locations where the public congregates unless the risks have been shown to be broadly acceptable.