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EAGLE POWER

WIND TURBINE
DESIGN & ACCESS STATEMENT

2009

[redacted] Greave Head Farm Ripponden West Yorkshire HX6 4NU
Web www.eaglepower.co.uk

MCS 1263

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1.0 Background

1.1 Section 42 of the 2004 Planning and Compulsory Purchase Act requires that a statement covering design concepts and principles and access issues be submitted with an application for planning permission.

1.2 Section 3 of Department of Communities and Local Government Circular 01/06 'Changes to the Development Control System', further outlines that a statement illustrate how design and accessibility aspects have been considered in the proposal, outline the rationale applied and how this relates to the local context.

1.3 The purpose of this Design and Access Statement is therefore to provide a better understanding of the proposal, which involves the erection of a Proven domestic scale wind turbine as part of a renewable energy scheme.

1.4 This Design and Access Statement shows how regard has been had to national planning policy guidance Planning Policy Statement 1 (PPS1) Delivering Sustainable Development and other relevant planning policy guidance notes.

1.5 The statement has also been prepared to assist in the consultation process and help inform the Council and public about the merits of the application.

2.0 Planning Policy Context

2.1 PPS22 Renewable Energy advises policies recognise specific location requirements of renewable energy sources and the potential for exploiting them. Small scale projects, it considers, can provide a limited but valuable contribution to overall outputs of renewable energy.

2.2 It recommends planning applications be assessed against specific criteria set out in Regional Spatial Strategies (RSS).

2.3 Paragraph16 of the policy statement refers to most renewable energy sources can only be developed where the resource exists. It further acknowledges in paragraph 20 that wind turbine developments will have the greatest visual landscape effect. This effect however is not regarded as an absolute constraint against the erection of wind turbines.

2.4 It can therefore be seen that the needs associated with accommodating the location requirements of a wind turbine are considered a material planning consideration. Wind energy can only be exploited where the wind energy strength is of sufficient force to enable the turbine to function properly.

2.5 In selecting the application site, full regard has therefore been had to this planning policy advice, and as such should weigh in favour of the proposal.

2.6 Regional Planning Policies in RSS also advise that there is a need to increase renewable energy and reduce GHG emissions by:

- maximising improvements to energy efficiency and increase renewable energy capacity
- reducing GHG emissions by maximising the use of power sources
- providing for new efficient energy generation in keeping with local amenity

2.7 The need for such development and ensuring operational efficiency is again emphasised.

2.8 It is recognised that at district level, local planning policies concerning land designation, amenity, environment and local renewable energy policy guidance also apply.

2.9 This Access and Design Statement is not however intended to address such matters, given that other planning supporting evidence is presented as part of the planning submission. This statement is primarily intended to address design and access matters.

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3.0 Design and Access Statement

Location& Setting

3.1 The site is located approximately 50mtrs from existing farm buildings at South Moor Farm in Dalby Forest.

3.2 The primary land use in the area is livestock grazing in Dalby Forest.

3.3 The site is situated in a relatively open setting. The location of the proposed turbine has been selected in order to benefit from the prevailing winds, contour heights and to avoid potential amenity/safety concerns that might impact on visitors/residents in the area.

3.4 It is important to maximise the incident of wind on turbine blades. EST Best Practice Guide, produced on behalf of the government notes "Wind speed increases with height and even small increases in turbine height can produce significant improvements in performance"

3.4 The site is considered relatively well located to accommodate a wind turbine because it is located where wind speeds can be effectively harnessed and because it is: (X)

[X] - situated where it can best integrate into the landscape
[ ] - set below the horizon/skyline
[ ] - is viewed with a hillside backdrop
[X] - viewed in association with nearby buildings/other rural features which help subdue the visual impact of the proposed development
[X] - located well away from residential properties
[X] - located well away from public footpaths/bridleways being on privately held land.

4.0 Design

4.1 PPS1 'Delivering Sustainable Development' considers good design is a key element in achieving sustainable development, it being considered indivisible from good planning. It states:
"Good design should contribute positively to making places better for people. Design which is inappropriate in its context or which fails to take the opportunities available for improving the character and quality of an area and the way it functions should not be accepted."

4.2 It is therefore necessary to establish if a development is appropriate in its context and/or can be seen to have regard to its surroundings to ensure it can effectively function.

4.3 Relative to this guidance the following factors are presented to support the design of the proposal and provide a rationale for its location on the site in question:

- the proposal is for one wind turbine of a domestic scale with colour finish of matt black turbine head and blades and dull grey mast. The scale and colour combination helps reduce the development's visual impact on the landscape
- materials include: slim line mast - galvanised steel; turbine head-plastic; blades-Twintex
- the built concrete footprint will be only 3 square metres in size, providing a base upon which a base plate and self supporting mast can be installed
- the cabling between the turbine and property to be served will be underground and will not visually affect the local environment; neither will such infrastructure work affect the existing drainage pattern or any established public utilities on site
- the Proven turbine is on a tilt up mechanism
- the blades have a tip designed to reduce noise and the operation of the turbine itself; it is currently the quietest on the market as there is no gearbox in the turbine head to emit gearbox sounds
- the turbine size and height has been chosen because it best serves the energy needs of the applicant and household

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- its location has been chosen to benefit from distance from properties and roads / public rights of way
- set in a relatively exposed location, with open topography the development is able to benefit from high unimpeded wind speeds

4.4 All dimensions and specifications are shown on the submitted plans and also in the Eagle Power planning information pack. The design of the turbine and its siting therefore, shows that it is both fit for purpose and that its function is best suited to benefit from the location shown on the submitted plan.

4.5 The PPS1 remit is concerned with more than design issues. Its guidance seeks to address wider social, environmental and economic objectives through the development process to achieve totally sustainable and inclusive communities both in urban and rural areas that take into account the needs of the community.

4.6 The erection of this wind turbine achieves this by:
- contributing to renewable energy generation
- helping to meet the energy needs of the applicant's property in a cost effective way, countering existing fuel deficiency
- contributing to meeting the energy needs of the wider community, helping it become more inclusive
- reducing green house gas emissions by creating energy from a renewable resource in an efficient way due to application of good design principles and application of an appropriate location for the development.
- helping to reduce the effects of climate change evidenced by rising global temperatures, rising sea levels and increased flooding events in our river valleys and plains.

4.7 It is the wider environmental benefits, which provide an acknowledged special circumstance for acceptance of an increased visual presence of wind turbines in our landscape. The overall growth, nationally in turbine development suggests an acceptance of this form of development as a design solution that effectively helps address some of the social and environmental problems outlined.

4.8 Such a development trend is supported by other complementary initiatives. A supplement to PPS1 **"Tomorrow's Climate, Today's Challenge"** makes reference to the government's Climate Change Bill which commits the UK to reduce carbon dioxide emissions by the year 2020 by 26%-32% from 1990 levels, and a reduction by 60% by 2060.

4.9 This can only be achieved if the merits associated with renewable energy initiatives, such as the wind turbine application proposal, are more fully accepted by the planning process.

4.10 Specific weight therefore needs to given to the design features incorporated in this development, and more positive recognition given to how this design effectively exploits wind power if located where prevailing wind strength enables this to happen.

4.10 For all the said reasons the design of this wind turbine is able to satisfy most planning policy and amenity considerations.

5.0 Access

5.1 The site and land under the applicant's control can be adequately accessed from the wider highway network and from within the site to enable construction, annual servicing and maintenance of the proposed turbine.

6.0 Conclusion

6.1 The information provided has sought to address Design and Access matters. Should additional information be required on this aspect, please contact the applicant/agent who will only be too pleased to assist.

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South Moor Farm- 6kW Proven Wind Turbine.

Planning Supporting Statement.

Introduction.

South Moor Farm is a small isolated 80 acre farm used for rearing sheep and cattle, situated in a clearing in Dalby Forest. Six years ago we diversified into provision of Bed and Breakfast accommodation. We already have a solar panel for water heating and wish to produce our own electricity from a wind turbine to supplement the electricity we buy from Npower on their green tariff.

Extract from. **Renewable Energy Supplementary Planning Document North York Moors National Park Authority Local Development Framework**

Forest.

• Located in the south eastern area of the Park. • Sited on the gradually rising areas of former moorland and the moorland fringe areas. • Largely coniferous with some deciduous on the fringes. • Settlement is almost completely absent from the area with exception of occasional isolated properties. • Small hamlet of Low Dalby in the Dalby Forest is exceptional.	As forests will screen long distance views turbines could be located within clearings against a back-drop of trees or associated with buildings. Turbines may also be suitable around the edges of the forest where they can blend in to a backdrop of trees. Care should be taken to ensure that the turbine can operate effectively in the proximity of trees or buildings

Visual impact

Proven's small-scale wind turbines are designed so that visual impact is kept to a minimum without compromise to power output. Ideally, a wind turbine requires a location where it is exposed to wind from all directions, but consideration should be given to the visual impact. The turbine head & blades are black and the galvanised tower will weather to become a dull grey, making it almost invisible to the human eye at a distance in some cases.

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South Moor Farm- 6kW Proven Wind Turbine.

Noise

Proven recognise that noise can be a nuisance, not only to the owner of a wind turbine, but also to their neighbours. This is why Proven turbines have been developed as one of the quietest on the market. South Moor Farm as no close neighbours.

Most of the noise associated with larger-scale wind turbines comes from the gearbox located inside the nacelle (head). Proven's small-scale turbines are produced without a gearbox for this reason! No gearbox – no gearbox noise.

In severe winds, the blades fold away from the wind, thus reducing the exposed area. At the same time, the blades twist and reduce the speed. This prevents damage to the turbine and generator, whilst maintaining maximum output. It does, however, increase the noise, but this is balanced by the sound of the wind itself. During normal operation, the Proven turbine is generally regarded as one of the quietest turbines on the market.

Ornithological Issues

The Royal Society for the Protection of Birds (RSPB) supports the sustainable development of renewable energy such as wind power because it helps mitigate climate change, which they believe "poses the most significant long-term threat to the environment" – this was also echoed in a recent report in Nature. It concluded that over the next 50 years climate change is expected to drive a quarter of land animals and plants into extinction and that under the higher estimates of climate change a quarter of the birds could become extinct.

The RSPB described the report as 'a deeply depressing paper'. The RSPB further agree that developed alongside other forms of renewable energy and energy efficiency, wind energy has a key role to play in averting the worst of these impacts. Across the country as a whole, studies carried out at the UK's existing wind farm installations show hit rates of less than one per turbine per year. For example, nine turbines on the harbour wall at Blyth are in a busy bird area and of bird flights through the wind farm, only 1 in 10,000 resulted in a collision. This translates to 1-2 collisions per year per turbine. To put this into perspective, cars in the UK kill more than 10 million birds – every year.

When scaling this type of statistic down to our small-scale type of equipment, the rate drops even more dramatically to an almost non-existent figure! This fact, coupled with the careful siting of our systems, means that we can further protect our feathered friends and help to ensure their long-term future. Quite simply, birds are in far more danger from colliding with overhead power lines, being eaten by domestic cats, or hit by vehicles than they are from wind turbines.

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The Proven 6kW

Proven wind turbines are manufactured to marine build quality using galvanized steel, stainless steel and plastic components with blades in glass polypropylene material.

The Proven 6 is suited to a broad range of applications. It has been installed to provide energy for homes, farms, schools, local authority buildings, business and retail premises.

Outline Specification

- Rated Output: 6000W (6kW)
- Voltages available: - 48V / 120V / 240V / 300V
- Annual Output - up to 20,000 kWh (depending on location and average wind speed at the site)
- Rotor Diameter: - 5.5m
- Mast Height: - 9m or15m

The Proven 15kW

Proven wind turbines are manufactured to marine build quality using galvanized steel, stainless steel and plastic components with blades in glass polypropylene material.

The Proven 15 is ideal for larger houses, commercial premises, farms, telecoms applications and small industrial units.

Outline Specification

- Rated Output: - 15000W (15kW)
- Voltages available: - 48V / 300V
- Annual Output - up to 55,000 kWh (depending on location and average wind speed at the site)
- Rotor Diameter: - 9m
- Mast Height: - 15m

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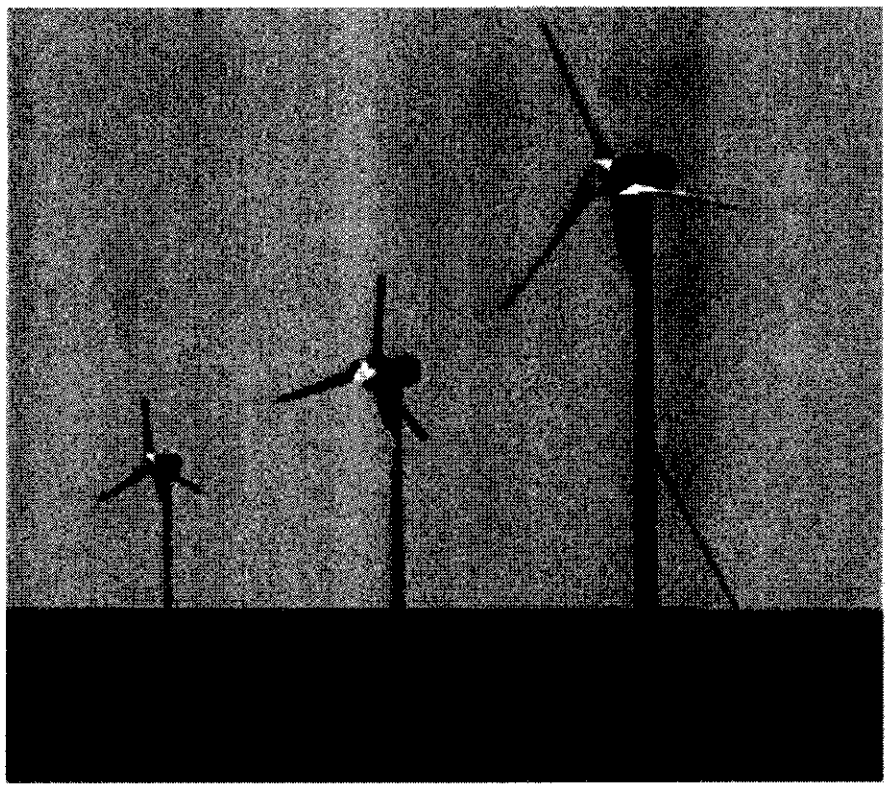
Masts

Each is of a tapered monopole design with no guy wires. They are constructed from hot dip galvanized steel to guarantee durability.

Proven 2.5kW - 6.5m (21ft) or 11m (35ft)
Proven 6kW - 9m (30ft) or 15m (49ft)
Proven 15kW - 5m (49ft), 20m (64ft), or 25m (82ft)



Relative size of the wind turbines

From left to right: 2.5kW/6.5m mast, 6kW/9m mast, man of 2m height, 15kW/15m mast

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Wind Energy Systems

All Proven Energy turbines are available in three standard systems, which manage the use of the electricity generated

1) Grid Connection

Electricity from the wind turbine is fed directly into the distribution board, providing power to the premises. Any surplus electricity produced may be exported to the grid and sold to the energy supplier. Convenience and the opportunity to sell excess electricity have made this the most popular option.

2) Battery Charging

Energy produced by the turbine is stored in a battery to provide a power supply. This is most beneficial for those which are not connected to the grid and which rely on a diesel generator. Installing a wind turbine can substantially reduce fuel consumption and benefit the environment by reducing CO_2 emissions.

3) Direct Heating

Energy produced by the turbine is directed to hot water tanks, storage heaters or under-floor heating, rather than providing electricity to feed into the power supply. This can substantially reduce CO_2 emissions produced by oil or gas heating systems.

A wind turbine should be located on a site with good exposure to the prevailing wind, ideally away from buildings and trees to avoid turbulence, which can severely reduce the output. Wind speed increases and turbulence reduces with height. In certain circumstances, there may be a compromise between obtaining optimal output from the turbine and the effect on the visual amenity, although this can be mitigated by our ability to paint the mast to blend in with the background.

The specific turbine being applied for and its design specifications are included with the planning application now submitted. This technical report, together with other associated documents, should be read together as they provide complementary information to help the Council give positive consideration to the proposal.

FURTHER INFORMATION AND ASSISTANCE

If further information is required please do not hesitate to contact the office.

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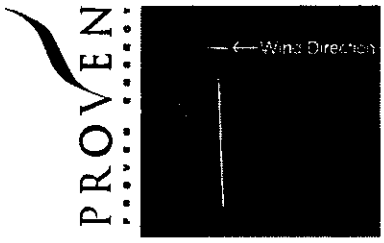

Proven WT6000 Wind Turbine

Mounted on TM1500 15m self supporting tower

Noise Emission Report

GENERAL

The dB (A) scale is the most common measure used to quantify noise. It covers sound intensity over the entire audible scale *and* takes account of the sensitivity of the human ear to give an overall measure of "loudness".

TYPICAL DB(A) LEVELS

Sound Level	dB (A)
Threshold of hearing	0
Whisper	30
Talking	60
City Traffic	90
Rock Concert	120
Jet Engine (10m away)	150

CURRENT BEST PRACTICE

In assessing the noise from a proposed wind turbine installation we are often interested in what noise levels will be at various distances from the wind turbine. It is accepted practice to *calculate* noise contributions from the wind turbine. This is because it is only practical to *measure* the wind turbine contribution accurately when it is 10 dBA above background noise. For example, background noise in a "quiet" environment is typically 30-40 dBA making it impossible to *measure* contributions less than 40-50 dB(A).

PROVEN WT6000 WIND TURBINE NOISE CALCULATIONS

Figure 1 shows how the noise emitted by a Proven WT6000 wind turbine on a 15m mast will disperse over the local environment. Maximum noise output at the base of the machine was recorded at 60dB(A) at a wind speed of 20 m/s. The noise output at the base of the mast in light winds 5m/s was 40 dB(A). The sound meter was held at a height of 1.5m from the ground. Background noise is louder than the turbine when more than 25m from the mast in both cases.

Figure 2 shows how the combined noise of wind turbine plus background; this is what will be detected by the human ear.

Figure 3 graphs the dBA difference between wind turbine and background plus common complaint classifications. *It can be generally taken that there will be no noise complaints where the turbine specific noise is 10dBA less than background.* This happens at a distance of 40-75m depending on wind speed.

Details of the calculations used in these graphs are given in Appendices B & C.

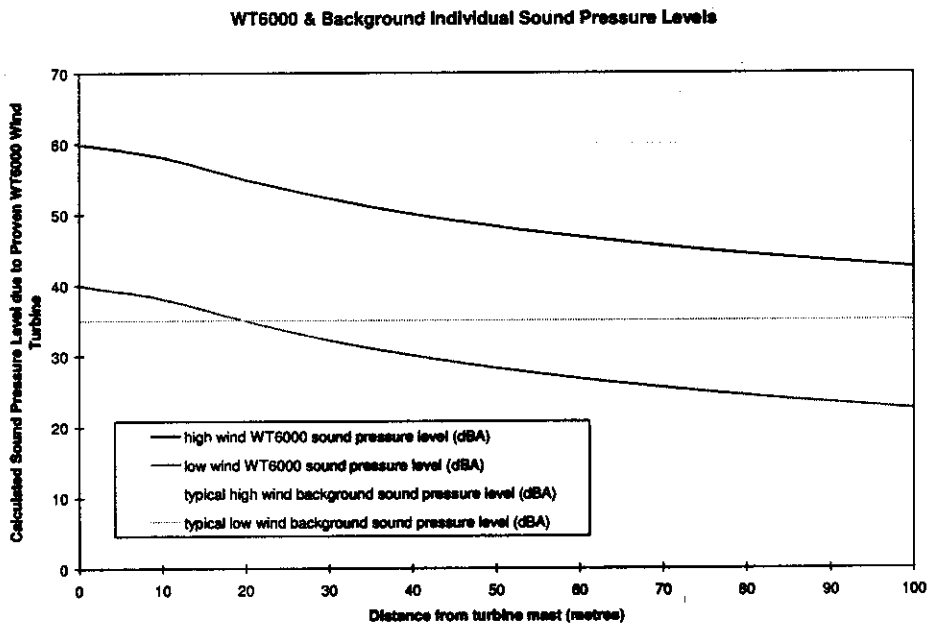

Figure 1

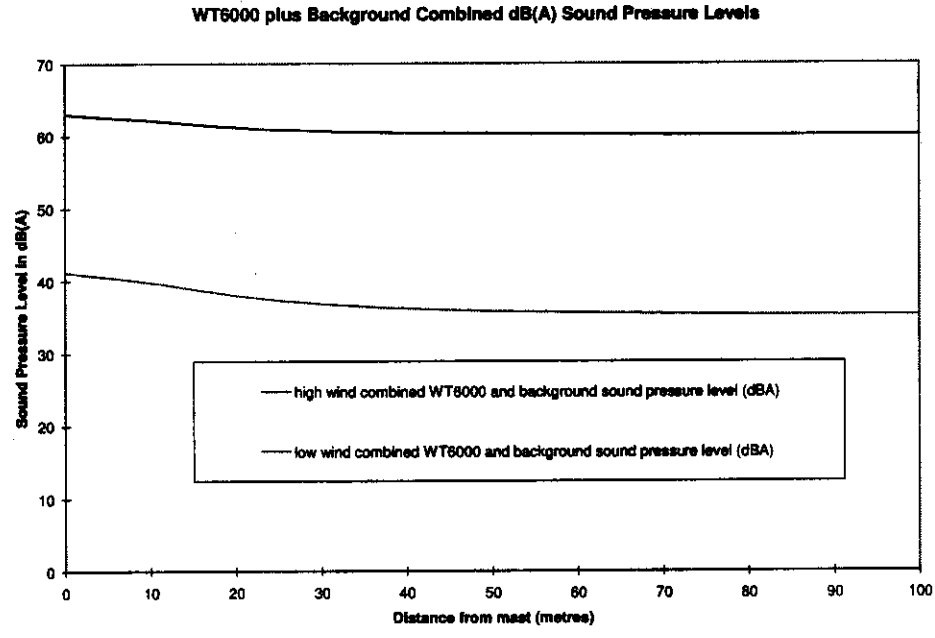

Figure 2

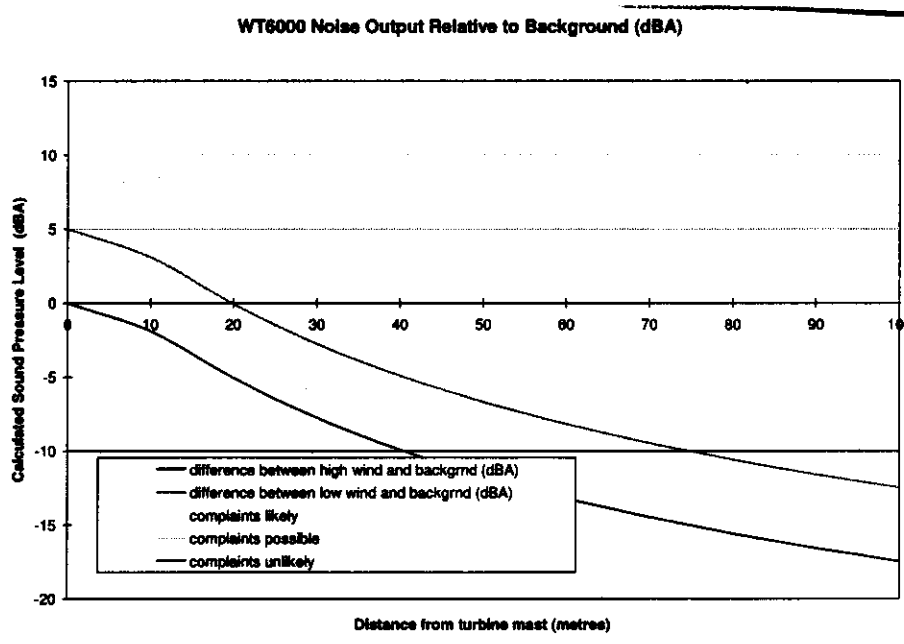

Figure 3

NOTE ON MEASUREMENTS USED IN THIS REPORT

All measurements were taken on a portable SL-25 dBA sound meter at our demonstration wind turbine site in Kilmarnock. Proven Wind Turbines emit a swishing noise only - we do not believe full tonal analysis is needed for our small wind turbines (see also Appendix A).

COMMENT ON THE CALCULATIONS AND ASSUMPTIONS USED IN THIS REPORT

The above method does not take account of wind "streaming" noise to the downwind side of the turbine. In practice, turbine dBA levels will be shifted downwind by a variable amount depending on the individual site.

In both cases the dB(A) readings taken as coming from the wind turbine **certainly also included a contribution from background noise in a nearby tree.** Secondly, in the graphs shown, the typical background dBA readings have been chosen very conservatively (low).

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Appendix A - Noise Reduction Features in Proven Wind Turbines

Feature	Benefit
Proven rotors are specially designed to operate at low rpm (typical max Tip Speed Ratio 6)	Blades and bearings rotate slowly keeping air noise to a minimum.
Direct Drive Permanent Magnet Generator	There is no gearbox as the rotor is coupled direct to the generator. This eliminates the gearbox hum which is the main source of noise in turbines with gearboxes. There are no touching parts.
Specially shaped blade tips	The rounded tips on Proven Wind Turbine blades are designed to reduce the vortices present at the end of any aerofoil. This keeps wind noise to a minimum.

Appendix B - Calculating Sound Pressure Levels

DEFINITIONS

1. Sound Pressure Level in dB(A) = 10 x $\log_{10}$ (sound power in W/m^2)

2. Sound Power in Watts/m^2 = $10^{0.1 \times (dB-120)}$

Given a sound power P_1 at distance d_1 from a noise source the sound power P_2 at distance d_2 may be calculated by the formula

3. $P_2 = P_1 x \left(\frac{d_1}{d_2}\right)^2$

ADDING DBA SOUND PRESSURE LEVELS FROM DIFFERENT SOURCES AT POINT X

First convert the dBA ratings at their initial distances to sound powers using equation 2.

Use the equation 3 to work out the sound powers at point X where you are interested in the total sound pressure level

Add all the sound powers together to find P_{total}

Convert back using equation 1 to find $dB(A)_{total}$

Appendix C - Calculations used in this report

	height to hub	15		dBA high	60							
	height meter	1.5		dBA low	40							
	initial height	13.5										
	inital dist	0										
	db=10log(power in w/m2)+120											
	sound power=10^(0.1(db-120)											
	horizontal distance (m)	actual distance	sound high (w/m2)	sound low (W/m2)	high wind WT2500 sound pressure level (dBA)	low wind WT2500 sound pressure level (dBA)	typical high wind background sound pressure level (dBA)	typical low wind background sound pressure level (dBA)	combined WT6000 plus background sound high	combined WT6000 plus background sound low	high wind combined WT6000 and background sound pressure level (dBA)	low wind combined WT6000 and background sound pressure level (dBA)
	0	13.5	0.000001	1E-08	60	40	60	35	0.000002	1.32E-08	63	41
	10	16.8	6.46E-07	6.46E-09	58	38	60	35	1.65E-06	9.62E-09	62	40
	20	24.1	3.13E-07	3.13E-09	55	35	60	35	1.31E-06	6.29E-09	61	38
	30	32.9	1.68E-07	1.68E-09	52	32	60	35	1.17E-06	4.85E-09	61	37
	40	42.2	1.02E-07	1.02E-09	50	30	60	35	1.1E-06	4.18E-09	60	36
	50	51.8	6.79E-08	6.79E-10	48	28	60	35	1.07E-06	3.84E-09	60	36
	60	61.5	4.82E-08	4.82E-10	47	27	60	35	1.05E-06	3.64E-09	60	36
	70	71.3	3.59E-08	3.59E-10	46	26	60	35	1.04E-06	3.52E-09	60	35
	80	81.1	2.77E-08	2.77E-10	44	24	60	35	1.03E-06	3.44E-09	60	35
	90	91.0	2.2E-08	2.2E-10	43	23	60	35	1.02E-06	3.38E-09	60	35
	100	100.9	1.79E-08	1.79E-10	43	23	60	35	1.02E-06	3.34E-09	60	35
							sound w/m	sound w/m2				
							0.000001	3.16E-09				

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NOISE REPORT STATEMENT - July 07

This measurement has been taken using a handheld noise meter at our wind turbine test facility located at Proven Energy Ltd, Stewarton, Scotland.
The results are merely an indication of the level of noise produced by our wind turbines and it may be inconsistent when measuring a similar wind turbine at a different location.

Proven Energy is committed to providing high quality products, and is in the process of commissioning and collating further noise reports on its range of wind turbines.

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