Delivering the UK's wind, wave and tidal energy

BWEA response to DCLG consultation:
PDR for small scale renewable and low carbon energy technologies.

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Introduction

With the best wind resource in Europe, we propose that wind products of all scales can deliver cost effective means of meeting national, regional and localized environmental, energy security, and economic objectives.

Consumer interest in small wind product is rapidly increasing, and BWEA welcomes DCLG's recognition that the planning system can become the enabler of the UK's transition to a low carbon economy. Over the next decade, helped by new financial incentives such as Feed In Tariffs, hundred of thousands of UK households, farms, and businesses will become increasingly energy self reliant, and will indeed become generators of their own renewable energy. DCLG's proposed streamlining of the planning system, to aid this anticipated ground swell of interest in self generation, is not only welcome but vital. The UK planning system cannot continue "business as usual" in the face of this energy revolution, but must adapt to cope with new demands for new technologies, but also to provide essential support in ensuring this period of transition is performed with control, with common sense, and with appropriate guidance.

GPDO policies hold the potential to provide support to hundreds of thousands of individuals and businesses, but it is also the case that GPDO can support and stimulate new industries, new economic opportunities, and new UK jobs. This point is highly pertinent with regard to the provision of permitted development rights to small wind systems. Unlike most small scale renewable technologies already covered by existing GPDO policies, the vast majority of small wind systems deployed within the UK are manufactured in the UK, and channel economic benefit to production plants, supply chains, and centres of commerce based in the UK. The industrial value added benefit of a mature UK small wind market, where barriers to market growth have been successfully addressed, could be significant. If the UK planning system can be made to work efficiently, effectively, and cohesively, then a successful indigenous market could grow. Out of such growth, UK small wind companies would gain the potential to maintain global manufacturing leadership and deliver a dominant position in lucrative, fast-expanding international markets for decades to come. The delivery of a mature and leading UK small wind industry would provide major economic and employment benefit to the UK as a whole.

BWEA believes that a successful UK small wind sector could deliver the deployment of 600,000 units (equivalent to 1.3GW, 1.7TWh per annum) by 2020 and 4 million in the medium to long term. With a strong home market (which currently represents ~20-25% of global demand), UK small wind firms can build on their current status as the world's largest exporting small wind industry and deliver annual revenues of over £750 million by the end of this decade. The global small wind market is current worth £150 million, but is expected to be worth billions of pounds within the next 5 years. It has to be clear that not only are there environmental and economic benefits to be secured in UK markets, but a supported UK small wind industry that fulfils it potential could secure a significant proportion of global market and provide over 10,000 UK based jobs in the short to medium term.

UK small wind system sector – Stats and facts

- **UK is the world's second biggest market for small scale wind** (<100kW) (2008);
- The UK market accounts for **20-25% of global demand** for small scale wind products;
- UK manufacturers hold an **82% revenue share** of their home market;
- There are currently **over 18 UK manufacturers** of small wind systems;
- The UK is the home of approximately half of the world's top 10 small wind manufacturers, including the world's second largest;
- By the end of 2008, the sector provided approximately 2,000 UK based jobs, creating **500 new jobs in 2008 alone**;
- The UK has the best wind resource in Europe;
- In 2008 the **UK became the world's largest exporter of small wind systems**;
- Export revenue for UK manufacturers doubled in 2008;
- **UK manufacturers export 50% of their production, to over 100 countries.**

Figure 1: UK small wind system sector – Stats and Facts

Key to optimising UK small wind industrial potential will be the creation of a high-volume indigenous market. With regard to GPDO policies, we support DCLG's aspiration to make small scale renewable technology something that UK citizens can easily, quickly, and sensibly install to the betterment of the owner, and society as a whole. Well sited small wind systems have the potential to contribute long term value to households, farms, and businesses. BWEA looks forward to discussing the content of this consultation with your department in due course.

Where is the market today?

In the context of volatile energy prices, energy security concerns, and growing environmental awareness, interest in small scale renewables continues to grow.

The best wind resources in Europe, a relatively aware and affluent consumer base, strong policy support, relatively high energy prices, and the existence of a large indigenous manufacturing industry have been the primary drivers of increased recent deployment of small scale wind turbines.

Between 2005 and 2009, BWEA analysis[1] estimates over 14,000 small wind systems[2] were deployed within the UK (compared to 2,520 large utility scaled wind turbine[3]). This equates to over 30MW of installed capacity, annually generating over 40GWh of clean green energy.

In the calendar year of 2005 just over one thousand (1163) small wind systems were installed in the UK. By 2007, the number of annual UK installations had risen to approximately 3,500. BWEA anticipated that over the next 10 years, driven by energy price rises and technology cost reduction annual deployment will rapidly increase such that by 2020 the number of small wind system being annually installed in the UK will stand at approximately 95,000 units. At UK market saturation, which BWEA expects to be reached in the 2030s, this figure could have doubled again reaching approximately 200,000 annual installs.

Up until now, all small wind system installations have required planning consent before deployment takes place. In context of ever expanding levels of interest in deploying small wind systems, this uniform requirement is delivering a number of problematic consequences for UK consumers, local planning authorities, regional and local government, national government, and UK industry. BWEA identifies the following impacts relating to each stakeholder:

Consumers:

(1) The cost of submitting a planning application deters consumer engagement, and weakens project viability;
(2) Satisfying Environmental Impact Assessment (EIA) screening and scoping requirements can be expensive, and time consuming. The associate requirements are often disproportionate to the scale of the development and act to deter consumer engagement, and weaken project viability;
(3) Unpredictable consideration of the planning application by the associate planning authority can act to deter consumer engagement;
(4) Lengthy decision making can frustrate and deter consumer engagement. Small wind system planning applications regularly require more than the 13/16 week statutory decision making timeframe, it is not uncommon for a small wind system planning application to wait up to 12 months before a decision on consent is provided.

Local planning authority:

[1] BWEA SWS UK Market Report 2009: http://www.bwea.com/small/articles/bwea_small_wind_system_uk_mark.html
[2] Small wind system is defined as a wind generator possessing a rated power of 0-100kW.
[3] This number refers to the historic cumulative number of large wind turbines installed within the UK by the end of 2009. UK Wind Energy Database (UK WED): http://www.bwea.com/ukwed/index.asp

(1) Additional financial and human resource pressure on local planners to provide timely, appropriate and proportioned decisions on planning applications. Local planning authorities are increasingly unable to cope with the demand;
(2) Resource pressure on local authorities is compounded by a lack of appropriate and sufficiently detailed technical planning guidance specific to small wind systems;
(3) Local planners often lack the technical expertise to quickly progress small wind planning applications, and do not recognise the significant locational and operational differences between small wind systems and large commercial scale wind turbines;
(4) It is not uncommon for large wind policy guidance to be disproportionately applied to small wind projects, often with the result of rendering the project financially unviable through the introduction of overbearing, inappropriate, and expensive planning requirements;
(5) Local planning authorities struggle to satisfy statutory decision making timeframes for small wind systems, it is not uncommon for a small wind system planning application to wait up to 12 months before a decision on consent is provided.

Regional and local government:

(1) A slow, expensive, and unpredictable planning system erodes the potential for small scale renewables to meaningfully contribute to regional and local government renewable energy targets;
(2) Inhibited growth of small scale renewable deployment negates the provision of related local economic employment benefits (Manufacturing, Supply Chain, and Installation);

National Government:

(1) A slow, expensive, and unpredictable planning system erodes the potential for small scale renewables to meaningfully contribute to national renewable energy targets;
(2) Inhibited growth of small scale renewable deployment negates the provision of related local economic employment benefits (Manufacturing, Supply Chain, and Installation);

Industry:

(1) A slow, expensive, and unpredictable planning system is the biggest barrier to UK industrial and market growth for small wind systems;
(2) Consumer and market confidence is impeded;
(3) The UK's world leadership in the manufacture of small wind systems is constrained, undermined, and at worst jeopardised;
(4) Significant UK economic and employment opportunities are being eroded;
(5) Significant environmental benefits are unrealised;
(6) Technological innovation and cost reduction is weakened through market constraint;
(7) Lack of robust and consistent planning processes and the appropriate decision making framework undermines the deliver of industry best practice.
(8) Inconsistent approach to acoustics and related siting requirements threatens consumer confidence, and industrial reputation;

BWEA recommends the content of this consultation has been constructed in an effort to address the interests of all the key planning stakeholders in successfully meeting and satisfying the objectives of the policy.

Terminology ("Swept area" and "centre of rotation"):

BWEA suggests GPDO size restrictions should be rephrased in terms of swept area (viewed in the horizontal plane) rather than rotor diameter, so that they are applicable to both horizontal and vertical axis wind turbine designs. This has the benefit of being technology neutral. Current proposed terminology is ambiguous with respect to Darrieus rotor wind turbines (which are typically vertical axis, but which could also be erected as long narrow rotors such as along a ridgeline). By referring to diameter the GPDO is essentially indicating a preference for the classic 'Danish'/horizontal axis technology. The UK small wind sector is in the early stages of development, subsequently care should be given to avoid restricting new rotor designs through inadvertent and inappropriate terminology within GPDO related legislation. Similarly, technology neutrality should be upheld through use of the term "centre of rotation" rather than "hub height".

For the purposes of this consultation response, BWEA uses the term "hub height" and "center of rotation" interchangeably.

For the purposes of this consultation response, BWEA uses the term "swept area" and "diameter" interchangeably, where "diameter" would equate to an equivalent "swept area".

BWEA recommendation: Use "swept area" instead of "diameter", and use "centre of rotation" in place of "hub height".

Size limits:

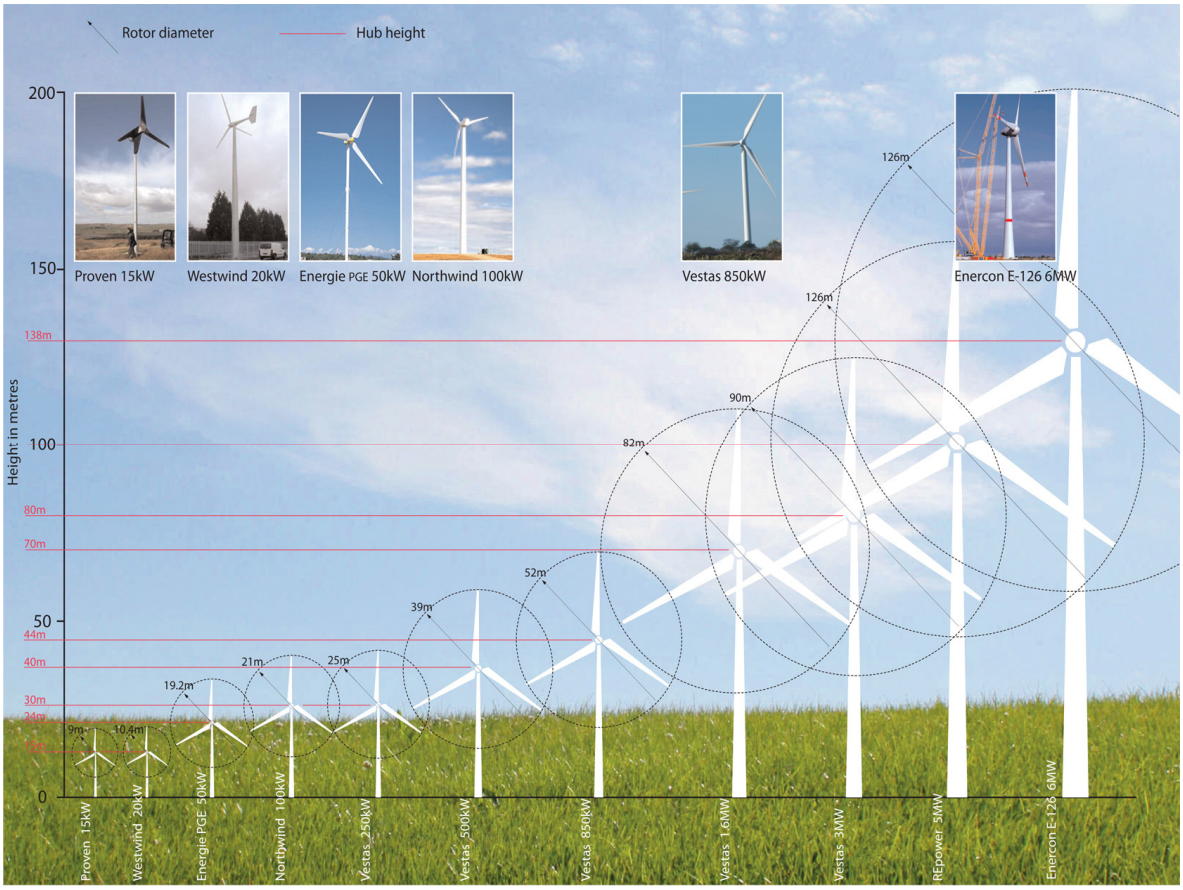

Figure 2: Comparative sizes of wind turbines.

BWEA notes that not even the smallest turbine illustrated within Figure 2 will be eligible for proposed GPDO policy inclusion on account of size limits.

Swept area limit:

BWEA notes that the laws of physics govern the comparative performance of turbines possessing varying swept area. Owing to a square relationship, for identical sites, a doubling of the turbine's swept area will have the effect of quadrupling the yield of that turbine. Up-scaling the swept area of a turbine will not only improve yield, but will also capture economies of scale both in manufacture and installation. As a general rule of thumb, a turbine with a large swept area will offer a disproportionately better yield, and economic benefits, than a turbine with a small swept area.

As BWEA will highlight below, this characteristic of turbine design provides the customer with an incentive to go as big as possible within limits of the site's locational and budgetary constraints. Given the relatively small swept area limits proposed within GPDO (particularly for domestic free standing installations), BWEA predicts customers will often be incentivised to install turbine possessing swept area in excess of proposed limits.

BWEA recommends the setting of small swept area size limits (particularly for domestic free-standing installations) will significantly inhibit the ability of GPDO policies to satisfy market demand and thus reduce the administrative burden placed on local authorities by planning requests. Thus BWEA recommends DCLG introduce rural size limits (see below) and increase the swept area limit for domestic free standing to accommodate scales of small wind system that better reflect market practice.

BWEA recommendation: Increase domestic GPDO free standing swept area limits to 9.7m^2 (diameter – 3.5m).

Centre of rotation (hub height) limit:

In order to aid policy development, BWEA has carried out quantitative analysis on over 450 sampled sites to identify how varying the centre of rotation (or hub height) for a small wind turbine can affect the wind speed, annual energy production, payback period, and thus consumer engagement with small scale renewable technologies on account of a site's economic viability.

The specific objectives of this work were as follows:

- Identify how many more viable sites are available when increasing the hub height;
- Identify the percentage increase in average wind speed;
- Identify the increase in average annual energy production and carbon dioxide savings;
- Evaluate how changing the hub height affects payback period.

Methodology:

A random sample of 435 UK postcodes were used and entered in the Carbon Trust – Wind Yield Estimation Tool to determine the wind speeds at 10m, 12m and 15m. The postcodes covered rural, suburban and city locations. The annual energy production values (kWh/year) at each given wind speed were found using the annual energy production curve (Figure 3) for a 6kW wind turbine.

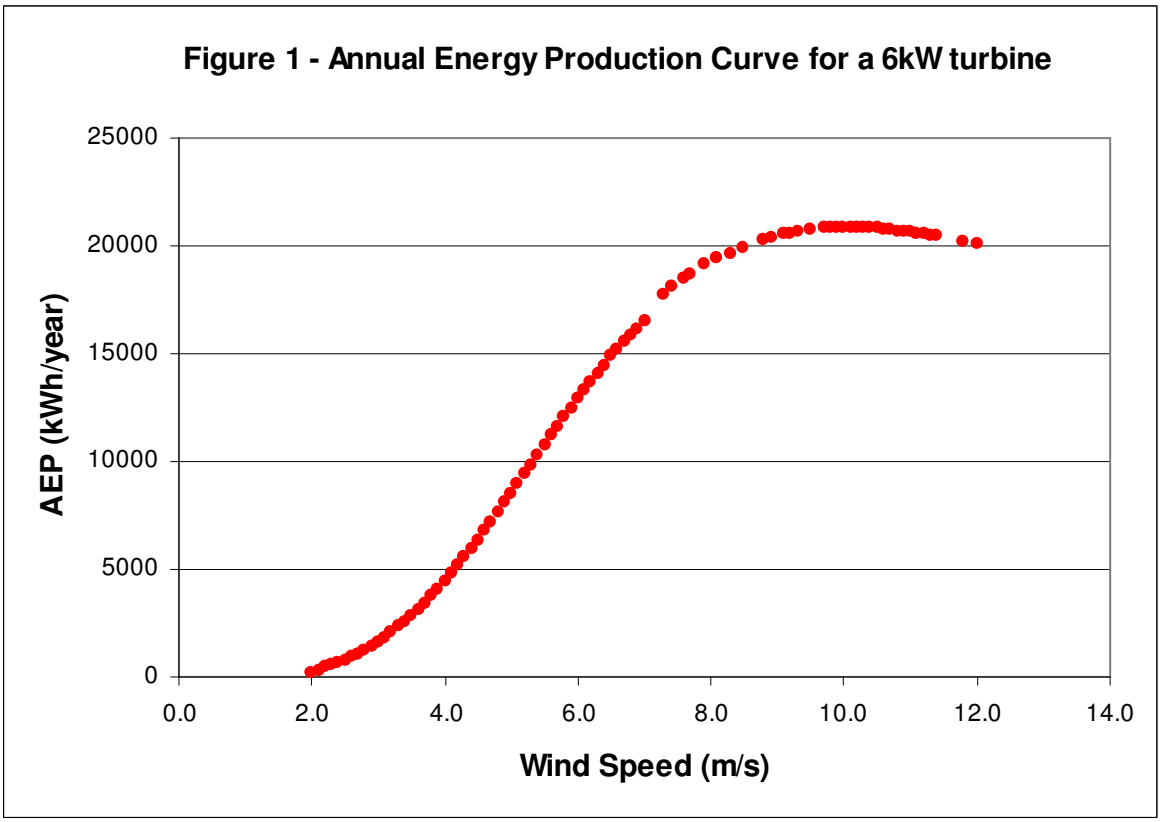

Figure 3: Annual energy production curve for a nominal 6kW turbine.

The corresponding carbon dioxide saving (kg/year) were calculated using the carbon conversion factor (0.53702 $kgCO_2/kWh$)[4]

Results:

- Effect on the number of sites:

	10m	**12m**	**15m**
Number of sites (with wind speeds above 4.5m/s)	74	99	142

Sites with a wind speed of 4.5 m/s and above are deemed as appropriate to explore setting up a small wind turbine. The percentage increase of sites from 10m to 15m was 92%.

The following tables of results consider the complete data set (435 sites) and the sites with wind speed of 4.5 m/s and above at 15m:

- Effect on average wind speed:

	10m	**12m**	**15m**
Average wind speed (whole sample)	3.8 m/s	4.1 m/s	4.4 m/s
Average wind speeds (for the no. of sites with wind speeds above 4.5m/s at 15m)	5.3 m/s	5.6 m/s	6.0 m/s

[4] www.carbontrust.co.uk

When hub height was increased from 10m to 15, average wind speed increased by 13%.

- Effect on annual energy production:

	10m	**12m**	**15m**
Average annual energy production kWh/y (whole sample)	4,073	4,906	5,943
Average annual energy production kWh/y (for the no. of sites for wind speeds above 4.5m/s at 15m)	8,605	9,779	11,091

- Effect on carbon dioxide savings:

	10m	**12m**	**15m**
Average CO_2 saving $kgCO_2/y$ (whole sample)	2,187	2,678	3,192
Average CO_2 saving $kgCO_2/y$ (for the no. of sites for wind speeds above 4.5m/s at 15m)	4,621	5,387	5,956

A 29% increase in both annual energy production and carbon dioxide savings was achieved.

- Effect on payback period:

The following results consider the payback periods at 5.3 m/s and 6.0 m/s (the wind speed at a 13% increase of 5.3 m/s) for a nominal 6kW wind turbine installed at hub heights of 10m and 15m respectively, where total cost is estimated at £26,400. This nominal 6kW turbine could possess a diameter of 6m and could be installed in a domestic and non domestic setting.

It should be noted that 6kW turbines, or equivalently scaled turbines, are commonly installed in the domestic sector.

When calculating the payback period, the following assumptions are used:
- Import generation = 50% at 15 p/kWh
- Export generation = 50% at 5 p/kWh
- Turbine lifetime = 20 years
- Feed-in Tariff = 26.7p/kWh
- Annual maintenance cost = £200

Wind Speed (m/s)	**Approximate annual energy production (kWh/year)**	**Payback period with FIT (years)**
5.3 (@10m)	8,605	8.9
6.0 (@15m)	**11,901**	**6.3**

Clearly the increase of hub height has a significant impact on the site's economic performance, and the likelihood that the customer will be sufficiently incentivised to progress the installation as a viable and worthwhile project.

BWEA would recommend the findings of this work to UK policy makers in considering the scale of permitted hub heights included within GPDO policies for small wind systems.

What does this analysis mean in the context of proposed GPDO size limits?

BWEA analysis shows that by increasing the permitted hub heights for free standing wind systems, the scope of policy support provided to the UK planning system could be increased significantly (98% increase in the number of viable sites).

This is to say, current domestic free-standing size limits would likely support less than half of the sites that would be viable at a 15m hub heights. Not only that, but for viable sites with hub heights of 10m, the customer would be strongly incentivised to increase an installation hub height up to 15m on account of a 30% increase in turbine performance.

BWEA also notes that customers, who enjoy access to good wind sites, will likely consider a turbine possessing a swept area in excess of proposed size limits (see section on Swept area, above).

In short, current proposed GPDO domestic free-standing size limits will likely offer policy support to only a very small proportion of the UK small system market. Customer will likely progress installations with swept areas in excess of proposed limits, and/or will select to progress the installation with a hub height in excess of proposed size limits.

BWEA also recognises that Ireland and France already have adopted and successfully deploy GPDO policies for domestic installations such that hub heights of 12m are permitted. We recommend that DCLG improve the scope of GPDO policies for domestic free-standing turbines such that UK holds at least parity with such planning requirements. Unless the domestic hub height limits are increased, at least in line with current French planning regulation limits of 12m hub heights, it is questionable as to whether the GPDO policy will get anywhere near meeting its primary objectives in aiding consumer, and support over burdened local authorities.

In order for GPDO to meet market demand, and satisfy core objectives, we suggest that the domestic free standing hub height limits be extended from 10m to 15m so to provide the following benefits:

- Increased GPDO policy scope will deliver additional relief to local planning authorities, by at least doubling the number of viable sites that will not require local consideration and burdensome administration;
- Avoid encouraging UK citizens to bypass the benefits of streamlined planning, and to bypass engagement with GPDO policies, owing to the financial (and environmental) incentives to install turbines at heights greater the GPDO scope. Current proposes would struggle to dissuade customers from installing at 15m hub heights owing to a 30% increase in financial reward. To put this in context, increasing hub heights from 10m to 15m would deliver greater financial benefit than many contemporary Government grant programmes can provide;
- Encourage greater consumer uptake and deployment of small scale wind turbines, and thus greater generation of clean green energy;

- Increased support to the growth of a world leading market for small wind systems. Reduced barriers to market growth will stimulate significant economic, environmental and economic benefits through the support of leading UK small wind manufacturers, and related supply chain benefits.

BWEA recommendation: Increase domestic GPDO free standing hub height (centre of rotation) limits to 12 -15m.

Rural size limits:

BWEA recognises that domestic customers with access to good wind sites will predominantly be those in rural locations, with little to no obstructions in close proximity to the proposed installation. Domestic customers living in isolated areas, with no residential buildings within close proximity, will be strongly incentivised to install small wind systems with swept areas in excess of current proposed size limits. For such installations, it should be recognised there is a reduced risk of visual impact on neighbouring residential buildings.

In such instances, BWEA recommends the GPDO size limits should recognise the particular considerations of isolated and rural householders by introducing customised domestic planning requirement. For those residential domestic sites where no neighbouring build is within a 200m perimeter of the proposed site, the customer is permitted to install in line with non-domestic size limits. To enforce such policy requirements, BWEA anticipates that the accredited MCS installer would be required deem the site in or out of GPDO eligibility.

BWEA notes the use of 200m is an arbitrary decision, and could be flexibly enlarged to take account of additional concerns over visual impact.

BWEA recommendation: Introduce rural size limits for isolated domestic sites with no neighbouring buildings within a 200m perimeter. Such size limits should mirror those applied to the non-domestic sector.

Summary of BWEA recommendations on size limits:

BWEA recommendation: Increase domestic GPDO free standing hub height (centre of rotation) limits to 12 - 15m.

BWEA recommendation: Increase domestic GPDO free standing swept area limits to 9.7m^2 (diameter – 3.5).

BWEA recommendation: Introduce rural size limits for isolated domestic sites with no neighbouring buildings within a 200m perimeter. Such size limits should mirror those applied to the non-domestic sector.

BWEA recommendation: Domestic building mounted size limits (total height & swept area) are reasonable.

BWEA recommendation: Non-domestic free-standing size limits (total height & swept area) are reasonable, and should be preserved.

BWEA recommendation: Increase non-domestic building mounted total height limit to 18m above the ridge line of the building.

BWEA recommendation: Increase non-domestic building mounted swept area to 28.5m2.

Noise:

BWEA recommends that the installation of a specified microgeneration installation should not cause an external noise level, due to the specified microgeneration installation alone, in any mode of operation or wind speed that will not be exceeded more than 10% of the time on the given site, above 45dB $_{LAEQ,\ 5\ min}$ at 1 meter from the façade of any neighbouring building, and in the case of small wind turbines, measured in accordance with BWEA Small Wind Turbine Performance and Safety Standard (Feb2008).

Why 45dB $_{LAEQ,\ 5\ min}$ is an appropriate external noise level for GPDO?

(1) Reduce burden on local planning authorities:

The use of a 45dB noise limit would allow GPDO to meet its primary objective in aiding the ability of householders, farmers, and businesses to small scale renewable energy generation, and in reducing an overwhelming administrative resource burden on local planning authorities. If a noise level of less than 45dB were implemented, it is likely very few sites would be eligible for permitted development thus forcing the majority of installations to seek planning permission;

Appropriate noise protection would encourage a reduction in the number of planning permissions being sought from local authorities, and thus helping to reduce administrative burden on an already stretched resource of the UK planning system;

(2) Empirical data shows low level of historic complaints:

A freedom of information request to all local councils in the UK revealing a very low complaint rate for both ASHPs and MWTs over the last 5 years suggests 45dB is an appropriate level of acoustic protection. Of the 5426 micro-wind turbines installed between 2005 and 2007, fewer than 5 complaints were upheld – 0.001% of installations have resulted in upheld complaints.

(3) Inherent industrial interest to provide robust acoustic protection:

Industry has a natural interest to adopt levels of noise protection that will prevent the cause of nuisance, and that will uphold consumer confidence and industrial reputation. In short, it is not in industry's interest to use inappropriate protective noise levels. The widespread market support for 45dB as a level of acoustic protection that will not harm industrial reputation is a point that should provide comfort to policy in adopting 45dB at least for the first two years of the policy;

(4) Industrial precedent for 49dB:

45dB is a more robust level of acoustic protection than applied to other domestic appliances – the flue noise for oil fired boilers must not exceed 49 dB(A): 4 dB(A) higher than currently proposed levels for small wind systems;

(5) Empirical data supports 45dB - desk based theoretical studies are demonstrated to be inaccurate:

Significant volumes of empirical data demonstrate 45dB is a far more robust level of noise protection than that currently provided through current UK planning system requirement. Despite current practice offering less robust protection than is proposed for GPDO, little to no complaints are being experienced.

BWEA would strongly question the accuracy of desk based analysis conducted by Defra acoustic consultants which purports that under prescribed scenarios the use of a 45dB noise protection level would deliver complaints in 97% of installations. BWEA would strongly recommend the assumptions used in this desk based study are not directly applicable to small wind system installation in acoustic terms. The extent to which the desk based study's findings are inaccurate is illustrated by the lack of supporting empirical data or hard supportive evidence, and the stark contrast such findings promote when referenced to reality, and small wind turbine acoustic data that has been collected over the past 5 years.

It is difficult to reconcile the quoted 97% complaint probability prediction with empirical data showing less than 0.001% of small wind system installations[5] have actually (in reality) resulted in upheld complaints. The relevance of Defra's desk based study, and its contrast with reality become even starker if one considers available market data clearly demonstrates significant volumes of historic small wind system installations are exposing neighbouring buildings to noise levels far higher than 45dB, with no resultant complaint; all of which have been installed with the permission of the local planning authority (See BWEA quantitative analysis on sample of current installations).

BWEA strongly urges policy makers to recognise the superior value provided by empirical evidence over desk based theoretical studies, with regard to informing appropriate Government policy decisions.

BWEA also recognises that the use of a 2 year review will allow the collection and collation of further empirical data to inform future policy considerations.

(6) BWEA quantitative analysis on sample of current installation:

BWEA quantitative analysis of a sample of approximately 500 micro-wind turbines shows current planning practice is less robust than proposed GPDO noise levels and is delivering negligible rates of complaints.

This study revealed that:

- **75% of sampled turbine installations** exposed the facade of the nearest neighbouring building to **noise levels in excess of 45dB.**
- **51% of turbine installations** exposed the facade of the nearest neighbouring building to **noise levels in excess of 55dB.**
- Of the 25% of the studied installations that exposed the facade of the nearest neighbouring building to noise levels of less than 45dB, the overwhelming majority were sited in rural settings with 67% of these at least 100m from the nearest neighbouring buildings.
- All sampled turbine installation were granted planning consent;
- None of the sampled turbine installations resulted in complaints on the grounds of acoustics.

[5] See industry FOI study.

- BWEA quantitative analysis show not only are micro-wind turbines not causing nuisance, but they are not causing nuisance when exposing neighbours to far higher than noise levels than those being proposed by industry for inclusion within GPDO.

In summary, thousands of small wind systems have been installed with the permission of the local authority, and are exposing neighbouring dwellings to noise levels in excess of 45dB (and indeed 55dB), and are resulting in **no complaints**.

BWEA has already provided DCLG with copies of this analysis but, if requested to do so, we would welcome the opportunity to discuss the details further.

(7) Robust protection provided by a plethora of "in-built" safeguards:

The proposed noise level is further supported by a number of "in-built" safeguards within the proposed MCS/BWEA methodology. These include:

- Tonal penalty of 5 dB for any turbine exhibiting tonal characteristics during distinct testing;
- MCS/BWEA Product testing uses a "Declared Apparent Emission Sound Power Level" - in laymen terms this means any product's stated noise level is topped up by a set proportion so to account for any possible error/variance - this adds 1.5 dB onto the product noise level, thus providing additional protection and system confidence;
- A V90 windspeed is used so to protect beyond the host property for windspeeds not experienced more than 10% of the time. The consequence of this component of MCS/BWEA noise mapping methodology should not be underestimated, for the vast majority of the system's operation required separation distances to neighboring buildings will offer protection to noise far lower than 45dB;
- GPDO policy is supported by robust, world leading standards (MCS/BWEA). The BWEA small wind turbine performance and safety standard currently forms the basis of new international small wind turbine standards, with the product acoustic test methodology having already been preliminarily adopted by the international community (IEC61400-2 Edition 3 Review Committee);
- Accredited installers will enact the necessary processes, enforce the policy, and ensure best practice is maintained to the benefit of all.
- A 2 year review will provide the opportunity to revise protective noise levels in light of enlarged knowledge, better understanding of the impacts, and technological advances in product acoustic characteristics;
- Proposed approach will stimulate innovation, and the speedy evolution of product design brought forward by market growth, without the latter you will not get the former.

(8) Protective noise level is not just for GPDO, but for the entire planning system:

The GPDO noise level would act as the de-facto noise level for the entire English planning system. As a result anything below 45dB would not only hold negative impacts for the performance of the GPDO policy, but also for the size of market available to larger product ranges that would be required to satisfy the related nose requirements whilst navigating standard planning processes. BWEA has conducted quantitative analysis on the affect GPDO noise levels would have on the wider market size and found that a reduction of the permitted noise level by just 3dB, significant economic and employment opportunities would be discarded.

BWEA small wind system market analysis:

By reducing the acceptable noise level threshold, turbine installations would generally be required to be installed at greater distances from neighbouring buildings. The effect of this would be to reduce the proportion of existing building stock that could acceptably make use of particular wind products. BWEA analysis examines the extent to which different noise level thresholds would impact overall market size in England and Wales[6].

	Impact of noise levels on market size (% reduction of a 45dB market)			
Size of small wind turbine (kW)	5 kW	11 kW	20 kW	50 kW
GPDO Noise level (dB)				
45 (Current proposals)	**n/a**	**n/a**	**n/a**	**n/a**
42 (3dB reduction)	**-21%**	**-21%**	**-25%**	**-21%**
40 (5dB reduction)	-35%	- 32%	-27%	-35%
37 (8dB reduction)	-54%	- 50%	-46%	-37%

By applying noise level threshold even 3dB below industry recommendations, **the UK small wind market will be reduced in size by between 21-25%,** with global industrial leadership severely inhibited at a crucial stage in the market's development.

In the context of anticipated UK market revenues (stated earlier), any reduction in proposed noise levels could negatively impact UK economic interests in to the tune of many hundreds of millions of pounds on an annual basis. The economic impacts of such a policy decision would be compounded yet further if one considers what effect the shrinking of the indigenous market of UK manufacturers would do to the ability of UK companies to compete internationally in fast growing international market, estimated to be worth billions of pounds within the next decade.

The UK small wind industry is world leading but at a very fragile and early stage in its development. BWEA would suggest the agreement of inappropriate noise limits would irreparably, and terminally, jeopardize the global competitiveness of UK manufacturing at this early stage in the technology's development.

(9) Industrial, economic, and employment benefits:

Should GPDO adopt anything less than a protective noise level of 45dB, significant economic, environmental, and employment opportunities would jeopardized. Excessively robust noise protection could unnecessarily and significantly reduce the viable UK market for small scale wind systems, irreparably damage UK industrial leadership, and prevent the creation of tens of thousands of UK based jobs (manufacturing, supply chain, installation, services);

[6] BWEA analysis uses a random sample of 41,626 buildings taken from the Post Office's Ordinance Survey Database for the Northwest and Southwest of England. Building grid coordinates were used to determine what proportion of the sample complied with windspeed (5+m/s average annual windspeeds, using the national windspeed database (NOABL)) and distance criteria (where no more than 2 separate property buildings are within specified distances of 80m, 100m, 120m, 140m, 178m, 220m, and 250m of the host building). The proportion of building stock which satisfies these criteria was then cross referenced with the tested acoustic characteristics of a range of small wind turbines to determine potential market size.

(10) Long term industrial investment in a 45dB noise protection level:

It would reflect a level of noise protection that industry has been working towards, and investing heavily in for over 5 years.

(11) Product innovation will encourage quieter products:

Appropriate protective noise levels will aid market growth, industry growth, product innovation, and improvements in future product acoustic performance. Without market growth, little revenue can be provided for such improvements.

Lack of product innovation would negate market and industrial ability to absorb reduced protective noise levels in future (e.g. at a 2 year review). 45dB is a protective noise level that will encourage improvements in product acoustic performance;

BWEA recommendation: Recognise the empirical evidence that is available and maintain 45dB $_{LAEQ, 5\ min}$ [7]as the protective noise level for GPDO and small wind systems.

BWEA recommendation: Use a 2 year review. 2 years following initial policy implementation protective noise levels should re-evaluated in light of enlarged knowledge, and increased understanding.

BWEA recommendation: Support protective noise levels through the use of industry standards – MCS/BWEA. Accredited installers and certified products will ensure robust protection is provided.

[7] 45dB $_{LAEQ, 5\ min}$ at 1 meter from the façade of any neighbouring building, and in the case of small wind turbines, measured in accordance with BWEA Small Wind Turbine Performance and Safety Standard (Feb2008).

Radar and aircraft communications

BWEA has worked with DCLG and DECC with regard to the development of the safeguarding webtool. BWEA will continue to support this process and endorses the use of MCS accredited installers to enforce and enact related requirements.

BWEA supports the principle of the safeguarding webtool but has significant concerns that overly cautious (i.e. expansive) safeguarding zones may negate the ability of the GPDO policy to adequately meet the swelling numbers of small wind system planning applications and reduce administrative burdens on local authorities, and their related reliance on statutory consultees. BWEA recommends safeguarding zone sizes to be proportional to the potential impacts of the related scale of turbine in question.

BWEA notes the safeguarding webtool has been under development for an unnecessarily long time, but should its prolonged lack of development should in no way prevent the timely implementation of GPDO policies for small wind systems.

BWEA is aware a number of studies have already been undertaken by technical experts, and have shown small wind system to present little to no risk to the integrity of radar and communications equipment. BWEA is surprised that, following over 12 months of consideration, safeguarding zones have yet to be constructed in proportion to the various scale of wind development covered by GPDO policy.

QinetiQ have measured the radar cross section (RCS) of the Proven WT2500 wind turbine, kindly donated by Proven Energy Ltd. The calibrated RCS data was analysed and the peak RCS measurements from the Proven turbine ranged from a minimum of 3dBsm to a maximum of 11dBsm, with the average RSC measured was 7dBsm[8].

QuinetiQ have also investigated the RCS of a micro turbine was measured and analysis of the data was undertaken looking at both the RCS return from the turbine structure and the Doppler return from the blades at yaw angles of 0, 45 and 90 degrees with respect to the radar[9].

QuinetiQ have also investigated the RCS of a Vertical Axis Wind Turbine (VAWT) with conclusions suggesting it is "highly unlikely that a VAWT will add any additional clutter levels to that already seen and dealt with by a radar"[10].

Figure 3 shows collated work performed by radar industry experts on comparable impacts on radar communication systems. Micro wind turbines, small wind turbines, and VAWTs present less of an impact on radar communication systems than a car or a truck.

The work carried out by QuinetiQ also clearly indicates the significant difference between large and small wind turbines in terms of their respective impacts on radar equipment - micro wind possess a radar signature less than 1/500th the size of a large wind turbine.

[8] http://www.bwea.com/aviation/aviation_resources.html
[9] http://www.bwea.com/aviation/aviation_resources.html
[10] QuinetiQ radar report (July 2008): Vertical Axis Wind Turbine Radar Impact Assessment using the qr5

BWEA would recommend the research already conducted should provide sufficient confidence for DCLG, DECC and the aviation community to progress a safeguarding webtool not only in a timely manner, but in a manner that does not inhibit the policy through use of overly conservative and excessively expansive safeguarding zones.

BWEA recommends: DECC and DCLG implement the safeguarding webtool in a timely manner, with safeguarding zones proportioned to the scale of development.

Targets	RCS (m^2)	RCS (dBsm)	Example Speed (ms^{-1})
Bird	0.01	-20	9-13
Man	1	0	0.8
Micro turbine	3.8	5.8	10-100
Small wind turbine	5	7	40
Cabin cruiser	10	10	8-13
VAWT	72.4	18.6	10-20
Car	100	20	13-30
Truck	200	23	13-26
Enercon E66 wind turbine	1995	33	30-70
Corner reflector	20379	43.1	0

Table 4-1 Comparison of the RCS values and speeds of a VAWT with other real world objects [7]

Figure 4: Tabulated comparison of the impact on radar assets of micro/small/VAWT wind systems and other everyday objects such as cars or trucks.

With regard to the safeguarding webtool it should be noted that the larger the safeguarding zone, the more small wind system installations will require full planning permission and therefore consideration by relevant statutory consultee. BWEA is concerned that the aviation community does not full recognise the administrative and resource requirements unnecessarily expansive safeguarded zones will deliver.

Shadow flicker

BWEA supports the approach taken by DCLG toward the address of issues relating to shadow flicker. BWEA notes it is anticipated that new MCS installer standards address shadow flicker in a site specific and product specific manner.

BWEA would question the stated requirement for turbine blades to adopt materials possessing low levels of light reflectivity.

The potential for light reflection from any aspect of a small wind system to affect neighbouring occupiers is likely to be very small and can be simply safeguarded by ensuring acceptable separation distances from the boundary on which a wind turbine is installed. In any event, BWEA would question how material reflectivity might be calculated, gauged, limited, and enforced in a scientifically robust and constructive manner.

Indeed BWEA acknowledges that proposed noise requirements would already require most installations to be sited significant distances from any neighbouring building.

BWEA recommendation: Requirement of non reflective blade material is removed a GPDO product requirement.

BWEA recommendation: Stated approach to shadow flicker is sensible, and based on robust industry standards.

Bats and birds

BWEA recognises that small wind system significantly differ from large wind turbines both in terms of physical size, operational characteristics, and locational considerations.

The consultation references the potential risks posed by "wind turbines" to birds and bats. BWEA would invite DCLG to clearly recognise that scientific surveys, collated field data, or indeed any historic ecological study concerning large wind turbines (defined as anything above 100kW) is very unlikely to provide any applicability to small wind systems scaled to within currently proposed GPDO limits.

BWEA notes there is currently available no robust scientific evidence that suggests bats or birds are unable to successfully navigate fully operational micro- and small-wind systems. Indeed there is a significant volume of anecdotal evidence that small wind system do not pose risks to bats.

Anecdotal evidence, example 1:
"Ampair are a 35-year old manufacturer of small wind turbines with well over 20,000 units deployed worldwide. Over the last four years Ampair have been actively monitoring reports of bird and bat interactions with their turbines during the discussions between Ampair and their clients.

Despite extensive feedback from customers and in depth monitoring of test turbines in an area benefiting from large local bird and bat populations, there have been no reported bat strikes in over 4 years and only one reported bird strike. The single bird strike was the result of a territorial fight between two birds where one was observed attempting to dodge behind a turbine so as to make an escape.

Ampair have extended an invitation to scientists studying bird and bat interactions with small wind turbines to visit their premises and test sites to monitor for themselves but none have taken up this offer."

Anecdotal evidence, example 2:
"The Marlec experience to date on the subject of bats & birds:

Like many other small wind manufacturers we run a number of small turbines continuously here on this site for the last 17 years so as a user are able to make some typical observations as well as draw information and feedback from users and product resellers the world over.

To give some perspective I can say that Marlec has sold a little under 100,000 small turbines since we started in 1979 and the most common application for these has been on sailing & narrowboats, at farms & other remote country sites and at caravan parks. In the last 5 years more commonly we have seen turbines installed on the edge of roadways to run safety signs.

I have canvassed the recall of others that have been with the business in excess of 20 years as well as my own memory and we believe a small number of probably less than 10 bird strikes are known to us over that time. We had one written report of a bat that flew into a turbine at a site in Cornwall that we can date to approximately 2001. A bird or debris struck turbine usually sustains physical damage, at minimum a broken blade, and as such users tend to contact us for service or spare parts.

It may be interesting to note that no one at Marlec can recall any recent reports over the last 3-4 years and yet this is the period when we have seen more products installed near hedgerows. We can speculate that since these signs are inevitably located at busy sites the traffic itself may be preventing birds & bats from nesting nearby.

It's worth noting that very many small turbines including our own are installed on sailing boats at coastal locations where gulls in particular are in abundance and yet strikes are rare. My own anecdotal experience is of sitting early evening on an inland boat with a turbine mounted and a number of bats flew around us and the turbine. The bats certainly seemed to intuitively avoid the moving object."

Anecdotal evidence, example 3:

"Eclectic Energy Ltd: Recent years have seen a steady increase in the deployment of wind turbines of all sizes for electricity generation. This trend has been mirrored by increasing concern over the impact of this technology on wildlife, in particular bat and bird species.

At present, there is no authoritative, evidence-based body of work that quantifies the effects of wind turbines on bats and birds. Rather, there are emotive beliefs based largely on intuition or at best anecdotal evidence.

The view that wind turbines pose a heightened risk to birds and bats, over and above that of other built structures, is routinely used to oppose or block proposed wind energy developments.

As a UK-based manufacturer of micro wind turbines (1.1 metre rotor diameter), Eclectic Energy Ltd would seek to balance the anecdotal evidence cited for bat/bird harm by stating that our experience does not corroborate this view. The company has supplied nearly 3000 micro wind turbines over an eight year period. During that time, we have been informed of only one possible bird collision with one of our turbines. There may have been other incidents of which we were not informed, or of which the turbine owner was not aware. However, if the problem was as profound and pervasive as suggested, we might expect bird/bat strikes to be reported more regularly than once on eight years.

There is not doubt that collision with a wind turbine is likely to prove fatal for a bird or bat, but in the absence of substantive evidence to the contrary, the level of risk posed by a wind turbine should not be overstated."

BWEA recommendation: BWEA would recommend the stated approach to GPDO with regard to bats and birds is reasonable and sensible.

High level summary of BWEA recommendations:

BWEA proposes the following size limit for domestic land use:

(1) Free-standing wind systems (Dom):

Centre of rotation (hub height):	12 (- 15m)
Total height:	13.75 - 16.75m
Swept area:	9.7m^2 (diameter: 3.5m)

(2) Rural size limits for free-standing wind systems (Dom) (where no residential building is within 200m of the proposed installation[11]):

Centre of rotation (hub height):	15m
Total height:	18m
Swept area:	28.5 m^2 (diameter: 6m)

These size limits correspond with proposed non-domestic size limits.

(3) Building mounted wind systems (Dom):

Centre of rotation:	Use total height limit only.
Total height:	3m above the ridge line of the building.
Swept area:	3.81 m^2

BWEA proposes the following size limits for non-domestic land use:

(1) Free-standing wind systems (Non Dom):

Centre of rotation (hub height):	15m
Total height:	18m
Swept area:	28.5 m^2 (diameter: 6m)

(2) Building mounted wind systems (Non Dom):

Centre of rotation:	Use total height limit only.
Total height:	18m above the ridge line of the building.
Swept area:	28.5 m^2 (diameter: 6m)

Additional overarching recommendations:

(1) Only MCS certified products are eligible for GPDO policies;
(2) Only products installed by MCS accredited installers are eligible for GPDO policies;
(3) GPDO policies should be reviewed 2 years following initial implementation;
(4) Proposed protective noise levels are reasonable and should be preserved and implemented on the basis of further review in future, and the benefit of industrial standard's "in-built" safeguards;

Note: Some detailed recommendations are not included in this summary, but can be found in the relevant section of this response.

[11] Acoustic siting requirements must take precedent, if associate separation requirement is greater than 200m.