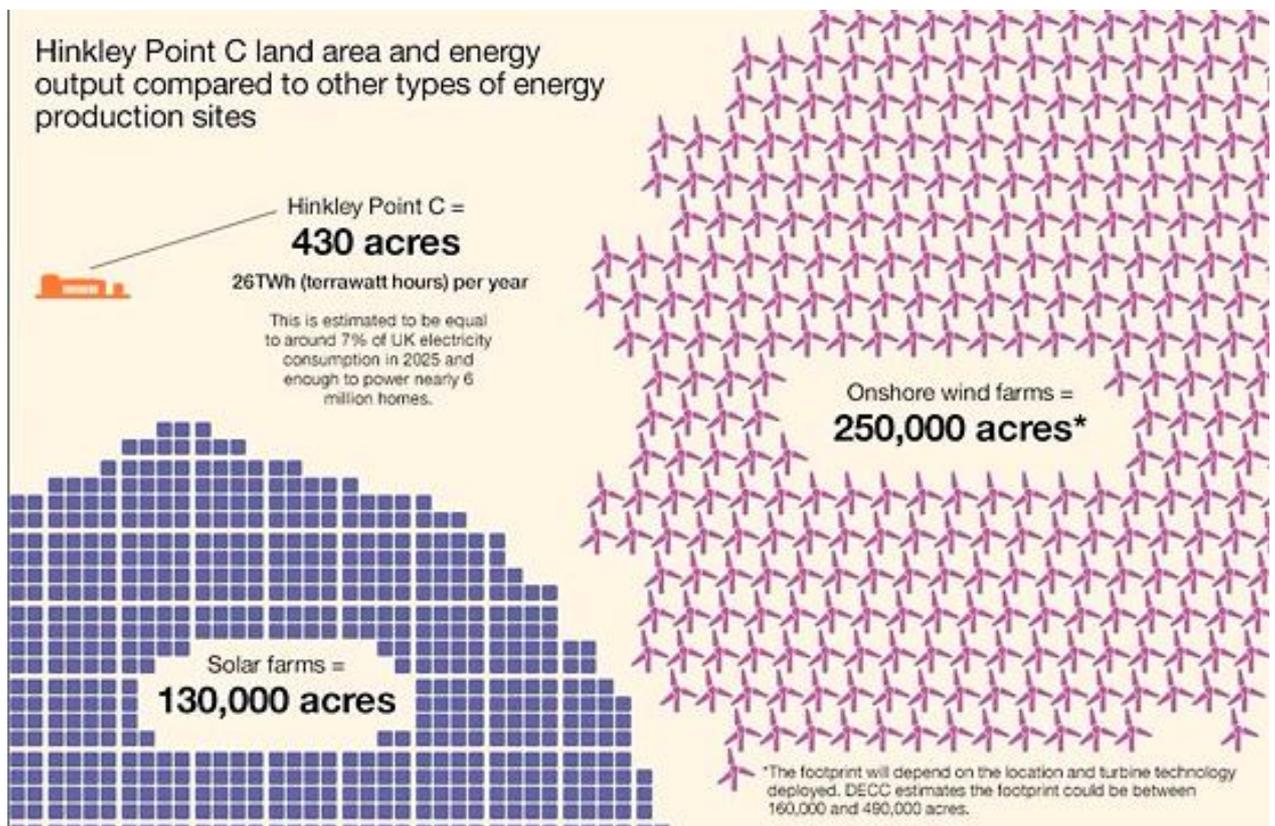


ALL-S4-POE-06

**The Mid Wales (Powys) Conjoined Public Inquiry into
5 Windfarm Proposals and a 132kV overhead Electric
Line Connection**

**Session Four
Alliance Proof of Evidence
Alison Davies
Wildlife and Ecology**

1. The Alliance Proof uses existing information and data to show that the impact of windfarms and their associated infrastructure will have a significant and irreversible effect upon the wildlife of Mid Wales. To do this we draw on examples and research that is readily available. Finally, the Alliance considers the strategic and policy context and potential conflict between the proposals and their inevitable infrastructure consequences.
2. Windfarms are being promulgated as the most accessible and cost effective method to produce secure, reliable, affordable electricity to a modern, energy hungry society. The following diagram, which sat on the DECC website briefly, shows the stark reality of their ability to power the UK.



3. The figure above shows Hinkley Point C land area and generation in comparison with similar installed capacity of wind power or PV.
4. The incremental destruction of countryside that is of low agricultural value, but rich in wildlife, has continued over the past 50 years despite the legislation

supposed to protect it, and this has become a matter of national and international concern. The State of Nature Report referred to previously is an Inquiry Document; however viewing the launch of that report in the Senedd gives a better understanding of how important this matter is. It can be viewed at: <https://www.youtube.com/watch?v=FnJQjtvnggA>

5. The Alliance contends that replacing dark soils and peat, along with timber extraction with concrete and other inorganic matter for road and access track as well as hard standing, substations etc. will have an irreversible, and overall negative effect.
 - 5.1 Peat and dark soils store, and trees absorb, CO₂. The soils of Mid Wales are dark soils: over one third of the Montgomeryshire Uplands are deep peat, a globally-acknowledged feature of national importance.
 - 5.2 There are currently 239 existing windfarm turbines in Powys, with a further 39 turbines at Cefn Croes, also in the Cambrians. Developers have informed us that each turbine has 300cu m of concrete in the base: $300 \times 278 = 83,400$ cu m currently in the Cambrians, as well as that used for the numerous individual turbines pock marking the county.
 - 5.3 158 turbines are the subject of this Inquiry: $300 \text{ cu m} \times 158 = 47,400$ cu m.
 - 5.4 At least a further 234 turbines are proposed and are known by the Local Authority: $300 \times 234 = 70,200$ cu m.
 - 5.5 Replacing the existing soil structure of mid Wales with 250,000 tonnes of concrete will worsen the flooding situation for Welshpool Airport, Shrewsbury, Bridgnorth, Worcester, Tewkesbury and Hereford, as well as threatening currently unaffected areas.
 - 5.6 The uplands naturally absorb water during the winter and release it slowly; during drier months this means that the lowlands also benefit from the steady supply of water. Over recent years arable farmers in Shropshire and Herefordshire have suffered from lack of water and despite new boreholes, have insufficient quantities to water their crops.

Flood and drought are common further down the rivers Severn and Wye. The effects are far-reaching.

6. The fragility of certain water life is demonstrated by looking at salmonids. They require very clean water and these are left to spawn by salmonids that have travelled up from the sea to small watercourses such as Afon Gam. If salmonids are in water that becomes disturbed they are very likely to be suffocated by silt. Mayfly and small invertebrates also suffer as they cannot feed or breed: this has consequences along the food chain. Because the life cycle of salmon means that they always travel back to the same area to spawn, after about five or six years they may show signs of some recovery, start to spawn on the Afon Gam again, but many salmon born there may starve to death, because the quantity of invertebrates upon which they feed may have drastically decreased or even died out.
7. The uplands have a far lower level of nutrition than the lowlands; in Wales a greater proportion of Uplands has been 'improved' than is the case in Scotland. The carrying capacity of Welsh Uplands is therefore lower than its lowlands and the Scottish Uplands. Species therefore require a larger area to feed. Birds are an excellent indicator of this: hen harriers cover tens of square kilometres (at least 3 windfarm sites!) because they are unable to get all they need in the one place. Species often rely on several sites for feeding and even if golden plover spend only a few days at a particular site, this does not diminish its critical importance to the birds' survival. Without that feeding place its chances of starvation and death increase, it will certainly be less likely to breed there and its breeding opportunity may be lost for at least one year.
8. Curlews are particularly shy birds that have a very long nesting season, from the beginning of March until the end of August. Disturbing birds during the nesting season is illegal; this means that there can be no construction activity within 600 metres of a curlew nest.
9. There is a requirement for farmers who claim Single Farm Payments that their land must be available for agriculture and in Good Environmental and Agricultural Condition (GEAC). Should a farmer claim for land that is not always available or in GEAC they can be fined as the claim is fraudulent¹.

¹ Appendix 1: letter dated 8 February 2009 from Elaine Debono, WG

10. The period available for site development and other site works will on many sites be limited by the factors noted in points 8 and 9.
11. By degrading the existing carrying capacity still further it is irrefutable that species' ability to survive, and therefore the biodiversity of the area would be damaged, probably permanently.
12. Ancient woodlands have created an environment that is exceptionally stable and has remained so for hundreds of years. Many species that inhabit woodlands are particularly suited to this environment; they need stability, they can't move very far and they move very slowly; they propagate slowly. The removal of an ancient woodland means not only removing the trees, which are habitats in their own right, but also the unique habitat that exists on the woodland floor and around woodland edges.
13. Bats require large areas for feeding and use trees and woodland edges as flight paths. The Alliance registers its concern regarding the subject of "an acceptable number of deaths" assumed by the professional ecologists. This collateral damage may avoid being deliberate, but knowing that deaths will occur is surely reckless in light of current research into turbine-related bat deaths.
14. Data is already before the Inquiry that shows that the amount of research in the UK is very low, whereas that in Europe and USA is far more robust in quality and quantity. All research states that there is not enough data²; however CCW, Natural England and SNH produced a joint paper "*Bats and Wind Turbines*"³, which is quoted below:

There is now considerable evidence from North America and mainland Europe to suggest that the siting and operation of wind turbines can have an adverse impact on bat populations. There is also a steady build up of evidence within the UK, which suggests that wind turbines could have a negative impact on bat populations in the UK.
15. Montgomery Canal is unusual in that it is fed by the uplands. Changes to the uplands will undoubtedly affect the canal, the water of which is exceptionally

² Appendix 2: Brief Summary of recent International Research on the Risk to Bats from Wind Turbines.

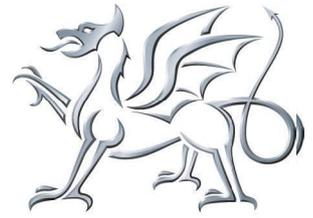
³ Appendix 3

pure; freshwater sponges grow at the lock gates and the canal itself is a Special Area of Conservation.

16. The proposals before this Inquiry have assumed the development of the Hub at Cefn Coch with its associated networks of lines in and out of the 27 acre site. It is important to note that the site proposed by National Grid for the Hub is the subject of the land management agreement which is a condition of the planning approval for Tir Gwynt windfarm. Should the site for the Hub be approved this will conversely mean that Tir Gwynt cannot be, as the loss of 27 acres plus the access tracks would reduce the compensation and mitigation required for the planning application.

Conclusion:

17. The evidence from other windfarms in the area, that presented before this Inquiry and the lack of baseline data for much of the proposed sites shows that the impact on the natural environment locally and further afield is far greater than the developers would have us to believe.
18. The area that is of interest to this Inquiry has more than:
 - a) 1108 ancient woodlands
 - b) 38 wildlife sites
 - c) 81 Sites of Special Scientific Interest
 - d) 3 National Nature Reserves - Berwyn, Roundton and Claerwen
 - e) 1 Special Area of Conservation
19. It is also of note that Radnorshire has more SSSIs than any county in England or Wales.
20. The Alliance believes that the proposals before this Inquiry, if approved, could cause unacceptably serious harm to Mid Wales. The collateral damage will be not only the bats and other 'acceptable deaths' but also the social fabric of the area along with its economic foundations which are built upon the natural environment.

**Taliadau Gwledig Cymru
Rural Payments Wales**

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Alison Davies
Chairman
Conservation of upland
Powys

Dyddiad / Date: 8 February 2009

Dear Alison,

Thank you for your E-mail of 18 January concerning the Single Payment Scheme (SPS) and wind farms. Please find below a response to your queries in the order you have raised them. I have not been able to open the attached images so the below is based purely on your e-mail.

You are correct in your understanding that land taken out of agricultural production for construction works would be ineligible for SPS for the whole of the scheme year that the activity was taking place. The features as identified by you i.e. turbines, crane hard-standing, access tracks etc are not regarded as agricultural areas for SPS and therefore are not eligible for subsidy and, as you correctly stated, would result in an appropriately reduced field parcel size for subsidy purposes.

You have questioned how an SPS claim would be affected between the construction period and the full reinstatement of land parcel, I can confirm that in order to claim SPS subsidy on the affected land the applicant must be able to demonstrate they were meeting environmental requirement of keeping land in "Good Environmental and Agricultural Condition" (GEAC). There are no available concessions within the legislation that allow land taken out of production due to construction works to remain eligible for the SPS so land not able to be returned to agricultural use in any year could not be claimed for payment.

In regard to measures in place to ensure that the Single Application Form (SAF) is accurately completed, it is the applicant's responsibility to ensure that they accurately declare all the land that is at their disposal on the SAF. This includes taking account of any eligible land taken out of production for construction such as this. In addition each year a percentage of farms would be subject to inspections under Cross Compliance rules. If breaches are discovered during an inspection the claimant risks losing some or all of the payment, this may include where appropriate retrospective penalties for multiple prior years.

Any farmers looking to allow wind farm development on their land will need to ensure that any compensation they negotiate is sufficient to compensate them for any loss of income from SPS (as well as their usual farming business) and that they are not left with SPS entitlements they have insufficient land to activate.

I hope this is helpful.

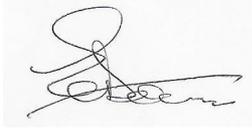


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Yours sincerely

A handwritten signature in black ink, appearing to read 'Elaine DeBono', is enclosed in a light grey rectangular box.

Elaine DeBono
Head of Rural Payments Wales

Brief Summary gathered by the Alliance, of recent International research on the Risk to Bats from Wind Turbines

Acknowledgements:

- 1 Thanks go to Professor Paul Racey (Aberdeen) whose Press Announcement about the Risk to Bats from Wind turbines alerted us to these concerns, and who kindly sent the initial two Research papers. Thanks also are due to Professor Ingemar Ahlen (Uppsala, Sweden); and to Professor Tom Kunz (Boston, USA). Both Professors Ahlen and Kunz have given us permission to quote from their Papers. The Bat Conservation Trust (UK) helpfully guided us through their comprehensive website. A Reference List of some of the Research Papers is attached at the end of this Summary, with guidance how to access them through the Internet, as they are all in the public domain.

Summary:

- 2 There is international acceptance that bats are killed by wind turbines, and also a concern that the population of some bats is in decline, including within the UK.

Legal Position:

- 3 The legal position in Europe is that in order to implement the EU Habitats and Species Directive, Member States have to enact their own domestic legislation, and in the UK this is done through the Conservation (Natural Habitats etc.) Regulations 1994 (amended in Scotland in 2004). The European Commission keeps a close eye on how well member States are implementing the Directive. During the past couple of years, the UK has been obliged to make some changes. Thus in the UK, the legal protection of bats was strengthened in relation to the EU Habitats Directive, and in Scotland the previous laws were again amended. We now have: The Conservation (Natural Habitats etc.) Amendment (Scotland) Regulations 2007. This states that **“It is an Offence, intentionally or recklessly, to kill, injure or take a bat.”**

- 4 Interestingly, the European Court of Justice in 2006 also made a Verdict against Germany, based on the Habitats Directive. This Verdict has been interpreted as “a prohibition against letting wind turbines operate if bat collisions are to be feared.” As a result, many wind turbines in Germany are now having to be stopped for periods of time (from Prof Ahlen`s Paper 26). (Verdict C-98/03).
- 5 In the UK, recent prosecutions for killing bats appear to arise mainly from domestic, building and renovation incidents. For instance, in March 2005 in Fife, a man was fined in Court for killing 6 bats which had found their way into his children`s bedroom. As yet there has not been a prosecution for bats being killed by wind turbines (Bat Conservation Trust).

Eurobats Convention:

- 6 There is a European Convention of Bat Experts, including UK members, called The Eurobats Convention. In 2006 the Eurobats Convention produced detailed recommendations for bat surveys in relation to windfarm applications and operations. These recommendations included the need for both comprehensive pre-construction bat monitoring surveys, and also post-construction bat monitoring surveys. These 2 types of surveys are required to identify both the pre-construction population of bats in an area, with their foraging, flight patterns and roosting behaviour (for both resident and migrating bats), and then after the wind turbines are up and running, to have detailed monitoring again, so that the effects of the operating wind turbines on bats can be established in the same area, with respect to their foraging, flight patterns and roosting behaviour, and to examine bat deaths beneath the turbines.
- 7 The Bat Conservation Trust hosted a DEFRA funded “Turbines and Bats Workshop” in the UK in February 2007. This drew bat Experts from all over the UK and from Germany, to focus on the implementations in the UK of the Eurobats Recommendations of 2006. One of their unanimous conclusions identified the urgent need to assess and quantify bat deaths around already

existing wind turbines in the UK (post-construction monitoring surveys). This would provide evidence for any further assessments required, and for recommendations in relation to bats and wind turbines in the UK for the future. Their priority was to identify the existing mortality of bats around already working wind turbines in the UK. They also noted the early research work of possibly using radar to discourage bats from approaching wind turbines (Nicholls and Racey 2007).

- 8 It is of concern to discover that in the UK there have as yet been **no** formal post-construction bat monitoring surveys at all since wind turbines started to be built (as at 2009). There have been no surveys to discover how many bats are being killed by wind turbines. There is only anecdotal evidence in the UK that bats are being killed by wind turbines, usually provided by researchers looking for dead birds beneath the turbines. For instance, an ornithologist discovered the bodies of a Pipistrelle bat and a Red Kite at the Braes of Doune Windfarm in Stirlingshire in Autumn 2007. Although financial subsidies are being paid to Energy Companies to encourage the construction of wind farms, no monies are being released to fund the necessary independent research into the consequences of operating wind turbines, particularly in relation to bat deaths (as at 2009).
- 9 Until such time as this situation is rectified, we have to rely for evidence on post-construction bat surveys from overseas. In the world of scientific research, it is good practice to do so. Although we recognise that some of the overseas bats may be of a different species to those in the UK, there is evidence that some of the bats studied are of the same species as those found in Scotland (e.g. Pipistrelles and Daubenton's bats mentioned in Prof Ahlen's Papers, and Pipistrelles mentioned in Prof Kunz's Paper).

Bats:

- 10 Before looking in more detail at some of the research Papers, it is useful to establish why there are so many concerns about bats. Bats are small flying mammals which are aerial hunters of their insect prey. They will fly long

distances following insects, and have been observed in Sweden flying about 14 kilometres out to offshore windfarms to hunt overnight before returning to land. They occupy an important place in the natural balance of nature's ecosystem, and together with insect eating birds such as swifts, swallows, house martins, red kites and willow warblers, take care of our insect population, including mosquitoes and midges. Insect-eating birds take care of the day shift, and bats take care of the evening and night shifts. It is estimated that one bat may eat 3,000 insects in one night. Within Europe, bats are considered now to be amongst the most endangered species of mammals, and their numbers are in significant decline (Brinkman and Schauer-Weissahn 2002). In contrast to some other mammals, bats are slow to reproduce; the female bats usually giving birth to only one baby bat each year, in early summer. If a lactating bat is killed, then her pup will also die of starvation. Bats are vulnerable to natural disasters too, and in the summer of 2007 which was cold and wet, there were not enough flying insects for the adult bats, and the national helpline of the Bat Conservation Trust was inundated by calls from members of the public who were discovering baby bats starving, exhausted, and dying. Cats are also predators of bats, particularly the baby bats emerging from their nursery roosts. Because of their slow reproductive pattern, bat populations are particularly vulnerable to any deaths. All the researchers confirm that new bat mortality factors (such as wind turbines) cannot be easily compensated for, and the cumulative effect of regular bat deaths will continue to have a serious effect on bat populations. In the face of natural dangers, and in relation to the already steadily falling bat population within Europe, it seems unacceptable that man made structures such as wind turbines should recklessly present further hazards to bats.

Where are bats being killed by wind turbines?

- 11 From reading the research Papers, we know that bats are being killed in significant numbers by working wind turbines within a whole variety of geographical sites, including forested hilltops, agricultural plains, deserts, coastal areas and lakesides. Both resident and migrating bats have been victims. This seems to be confirmed wherever post-construction bat surveys

are undertaken: in the USA, Canada, Spain, Germany, Australia and Sweden. (Kunz and Ahlen). Professor Ahlen reports that Bat Conservation International estimate that approximately 1 bat may die every 2 days (in West Virginia and Pennsylvania USA), while Professor Kunz estimates that **approximately 20 bats per MW of installed capacity may be killed annually in the USA.**

- 12 Bats emerge from their hibernation sites in March/April, and are particularly vulnerable then, and also during their breeding season (June to October). It is suggested however, that bats can probably be killed at any time of their active year before they hibernate again in November. Prof Kunz suggests that the only safe way to monitor bats is to undertake “full-season, multiyear research”, picking up the dead bodies within 24 hours, to reduce the effect of natural scavenging, which would render monitoring figures to be an underestimate.

How are bats killed by wind turbines?

- 13 From the research Papers it seems that bats are killed by wind turbines in two ways:
- i) **By collision** with the rotating turbine blades. Despite their echolocation skills, bats seem unable to identify the location of the moving turbine blades in time to avoid them. As we know, some blades can be rotating up to nearly 200 mph. It is estimated that about 20% of bat deaths around wind turbines are caused by collision with the rotating blades. (Kunz and Baerwald).
 - ii) **By barotrauma.** When the wind turbine blades rotate, they create a vortex of negative atmospheric pressure. The bats get caught up in this and are swept into the vortex of negative pressure. The negative pressure produces an effect like the bends in deep sea divers, and causes massive internal bleeding particularly in the lungs, causing instant death (barotrauma). Baerwald et al. (August 2008) describes

how more than 80% of bat fatalities at wind turbines are caused by barotrauma, rather than by collision.

- 14 Prof Ahlen says that internationally, the threat from wind turbines is now judged to be more serious for bats than even for birds, and understanding why bats are being killed by wind turbines remains an urgent priority.

Why are bats being killed by wind turbines?

- 15 In 2002, Prof Ahlen undertook a Pilot Study during August to September in south-eastern Sweden. 160 wind turbines were investigated, resulting in 17 bats (of 6 species) and 33 birds (of 17 species) all found killed. Half the bats were resident and half migratory. Almost one third of the birds were swallows and swifts (which are insect-eating). Other birds included willow warbler, mute swan, golden plover, buzzard and red kite. Observations with heat imaging cameras showed that bats were actively hunting for insects in and around the turbine blades.
- 16 He continued these studies in 2003. He found no evidence of acoustic attraction for bats to wind turbines. However, he did find that around the tops of the wind turbines (the nacelles) there were clear concentrations of flying insects, probably due to the heat radiation emitted by the nacelles. Using a heat imaging camera, it could be seen that the top part of the tower, the blades and the generator were warmer than their surroundings during the evening and the early part of the night. His observations showed that the attraction of insects to the wind turbines caused a concentration of hunting bats of both migrating and non-migrating species. Those same species were found dead under the turbines in the mornings. He confirms that bats are at serious risk from wind turbines.
- 17 Also, in his study of Bats and Offshore Windfarms in 2007, Prof Ahlen found that as well as migrant bats, resident onshore bats were flying out about 14 kilometres across the sea to the wind turbines to feed on the abundance of insects around the nacelles of the turbines. For both the insects and the bats,

the best flying conditions were in calm weather, or in a light breeze. The insects were collected and included many mosquitoes. It was discovered that some bats fed by skimming the water one minute, and then swooped up to feed in and around the turbine blades, so flight altitudes were very variable, depending on the available insects, and were different to their usual altitude patterns. Surprisingly, Pipistrelle bats (common and pygmy), and Daubenton`s bats were found flying out to the offshore turbines in large numbers. Sometimes, Pygmy Pipistrelles used the turbines as roosts. Prof Ahlen concluded that bats will fly several kilometres to hunt insects, even over the sea, before returning to land. As insects seem to be attracted to the heat generated by the nacelles of wind turbines, bats will hunt them there, among the blades. The risk of collision or barotrauma is therefore as great at offshore windfarms, as at onshore windfarms.

- 18 Prof Kunz and Colleagues, and the UK Bat Experts also confirm that further research is needed to explore the phenomenon of insects gathering around the nacelles which then attract bats to wind turbines (Prof Kunz in fact suggests 11 hypotheses which require urgent research including insect attraction, echolocation failure, and electromagnetic field disorientation).
- 19 In the Autumn of 2007, Horn et al. (of Boston) prepared a Paper to be published in the Journal of Wildlife Management, but released videos early, taken with a heat imaging camera, of bats flying and hunting in and around wind turbine blades.

The risk to bats from working windturbines:

- 20 Understanding this recent research, we are now aware of the active new dynamic which working wind turbines will introduce into the environment for bats. It seems that the heat generated by the nacelles of the working turbines attracts insects in great numbers, and that bats will alter their previous flight patterns and deliberately fly to the nacelles to hunt the insects, and therefore be placed at risk of death, from collision with the blades or from barotrauma. We now know that bats will follow swarms of insects over great distances to

forage, even over the sea to offshore turbines, before returning home to their land roosts. We can be aware therefore, that the Risk Assessment for Bats from Wind turbines cannot be fully established by solely relying on pre-construction bat monitoring surveys, as we know now that insect and bat behaviour will alter once wind turbines are up and running. We know that insect eating birds (e.g. swifts and swallows) will also fly to working wind turbines during the day, and be at risk of collision.

- 21 This information of the effects of insect behaviour around wind turbines attracting bats actively to forage around the nacelles, and changing their previous flight patterns, is now in the public domain.
- 22 In relation to this information, the question could be asked as to whether the continued construction of wind turbines could be considered to be an offence of “recklessly killing bats”.
- 23 Should wind turbines continue to be constructed and the bat population decline further, then we might be faced with an upsurge in the numbers of midges and mosquitos.

Addenda:

- 24 In 2009 it was announced that the Leverhulme Trust had awarded a research grant to Dr. Kirsty Park of Stirling University for a 2 year study, of the effects of domestic wind turbines on bats and birds. There is already observational evidence that bats and insect-eating birds such as swifts and house martins are being killed by microturbines. This is thought to be the first such study of its kind in relation to domestic turbines.
- 25 Dr. Park`s Statement can be accessed at:
http://www.leverhulme.ac.uk/news/Awards_in_Focus/RPGS2 (underscore between ‘Awards’ and ‘in’, and between ‘in’ and ‘Focus’). In 2012 Dr. Park published her results in her initial Paper which can be accessed at:
<http://dx.plos.org/10.1371/journal.pone.0041177>

and a further Paper published in the Journal of Applied Ecology 2012 entitled: “Integrating Applied Ecology and Planning Policy: the case of Microturbines and Wildlife Conservation” (Kirsty J. Park, Alex Turner and Jeroen Minderman)

- 26 Also in 2009 Amy Coyte (then Chief Executive of the Bat Conservation Trust) confirmed that research has now been commissioned by DEFRA to establish whether wind farms pose a threat to bat populations in the UK, and that the University of Bristol in partnership with BCT will take the preliminary research forward. To our knowledge this will be the first such research project in the UK (Bat Conservation Trust: Bat News, Issue 88, Spring/Summer 2009, ISSN 0269 8501, and www.bats.org.uk).
- 27 An update from SNH in December 2010 confirms that SNH is engaged in the Project Steering Group for the DEFRA “Bat and Wind Turbine Study”. The Study will be co-funded by DEFRA, the Countryside Council for Wales, Renewable UK and SNH. It will be carried out by Dr. Fiona Mathews and her Team at Exeter University (not now by Bristol University). The results of this Research Project would not be expected until Autumn 2014.
- 28 The results of these UK Studies will be important, in helping to clarify the risk to bats from wind turbines as discovered in the UK, and to compare the results with the many Studies already available throughout the world.

References:

Professor Ingemar Ahlen: his recommended Papers can be accessed at:

www.slu.se/ecology (click on Staff, then on Ahlen)

Paper 4: 2002 (Bats and Birds killed by wind power turbines)

Paper 10: 2003 Wind turbines and Final Report to the Swedish National Energy Administration (translated into English in 2004)

Paper 26: 2007 (Ahlen I, Bach L, Baagoe H J, Pettersson J) Bats and Offshore wind turbines studied in Southern Scandinavia

Paper 2009: (Ahlen I, Baagoe H J and Bach L) Behaviour of Scandinavian Bats during migration and foraging at sea. Journal of Mammology 90(6) 1318-1223

Professor Thomas H. Kunz: His paper can be accessed at:

www.frontiersinecology.org (and also if you Google the names of “RMR Barclay and E Baerwald pers comm.”)

2007: (Thomas H Kunz, Edward B Arnett, Wallace P Erickson, Alexander R Hoar, Gregory D Johnson, Ronald P Larkin, M Dale Strickland, Robert W Thresher and Merlin D Tuttle) “Ecological Impacts of Wind Energy Developments on Bats: Questions, Research Needs and Hypotheses” (Front Ecol Environ 2007; 5(6): 315-324)

Gustave P Corten, Herman F Veldkamp: 2001 Insects can Halve Wind-Turbine Power. This paper can be accessed at: www.cortenergy.nl/NATURE.pdf

Horn et al 2007 (Journal of Wildlife Management) the videos can be accessed at: www.bu.edu/cecb/wind/video and also at: <http://www.wind-watch.org/documents/infrared-video-clips-of-bats-interacting-with-wind-turbines/>

(Horn Jason; Arnett Edward; and Kunz Thomas) from Horn et al. 2008 Journal of Wildlife Management 72:1 123-132 and 2008 Jason Horn, Edward B. Arnett, Thomas H. Kunz, Behavioural Responses of Bats to Operating Windturbines (Journal of Wildlife Management 72(1) 123-132, 2008

Dr. Robert Brinkmann, Horst Schauer-Weisshahn: 2006 Survey of possible operational impacts on bats by wind facilities in Southern Germany (Frieberg, Conservation and Landscape management). This paper can be accessed at: www.buero-brinkmann.de/downloads/Brinkmann_Schauer-Weisshahn_2006.pdf

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www.ucalgary.ca/news/aug2008/batdeaths
also www.sciencedaily.com/releases/2009/09/090928095347.htm

Of additional interest:

Arnett E.B, Huso M, Schirmacher M, Hayes J.P.: May 2011(Frontiers in Ecology and the Environment), “Altering turbine speed reduces bat mortality at wind-energy facilities” <http://dx.doi.org/10.1890/100103>

Clive Hambler (Lecturer at Oxford University) writing in The Spectator (5 January 2013) “Wind Farms driving Birds and Bats to Extinction”
<http://www.kcet.org/news/rewire/wind/uk-ecologist-wind-farms-driving-birds-bats-to-extinction.html>



BATS AND WIND TURBINES

Compiled by:

Kat Walsh (Natural England)

Jean Matthews (Countryside Council for Wales)

Rob Raynor (Scottish Natural Heritage)



There is now considerable evidence from North America and mainland Europe to suggest that the siting and operation of wind turbines can have an adverse impact on bat populations. There is also a steady build up of evidence within the UK, which suggests that wind turbines could have a negative impact on bat populations in the UK.

In continental Europe, pipistrelle species have been found to be regularly killed by rotors in forested environments, even by larger turbines where the turbine blades do not come closer to the ground than 38m. Pipistrelle species have also frequently been observed foraging at altitudes where they would be vulnerable to the rotor blades. Foraging activity has also been noted around turbines sited in open habitat a few hundred metres from the forest edge. Casualties occur throughout the summer and early autumn period and are highest during lower wind speeds which nevertheless can lead to near maximum rotor speeds. (This is due to the gearing, which restricts the maximum speed at which the turbine blades can rotate as the wind speed increases).

In addition to the risk of direct collision between bats and moving turbine blades, potential impacts on bats include barotrauma (fatal lung damage results from the sudden drop in air pressure close to the turbine blades) and possible changes to bat behaviour (avoidance of areas close to turbines). The risk is clearly greatest if turbines are located within space that bats frequently use. Such a space may be anywhere close to a roost entrance, in a regular foraging area or on a regular bat flyway, which is commonly along a linear well-vegetated feature or a watercourse. Hedges and woodland edges are common flyways, but they may be along any boundary feature, especially in the absence of better cover.

Poorly sited turbines that kill bats or impact on behaviour are most likely to affect conservation status if they affect many bats of a common species or a small number of bats of a scarce species.

It is unclear why bats' echolocation abilities (sonar) do not help them to avoid wind turbines. It has been suggested that bats may be attracted to the ultrasound emissions created by operating turbines, or that this ultrasound may actually interfere with the bats when they are echo-locating. However, there is currently little evidence of bat interference from the emission of ultrasound from turbines, despite some turbine types generating detectable levels of ultrasound. It is possible that migratory species do not use this ability continually during migration, perhaps to conserve energy, or perhaps bats fly more rapidly when migrating than when foraging, and so may outpace their echolocation's capability to detect obstructions. It has also been suggested that bats may follow insects that are attracted to turbines or that bats may use the structures as landmarks or investigate them as potential roost sites.

It is clear that more research on this and the potential for wind turbines to impact on UK bat populations is needed. In particular, reliable information on the height at which different species of UK bats fly when commuting, foraging or undertaking seasonal movements, is essential if we are to estimate the potential collision risk that wind turbines may present to UK bats. Similarly, the extent to which bats use the types of habitats favoured as wind farm locations in the UK needs further investigation.

Existing guidance

Hundt, L (2012) *Bat Surveys: Good Practice Guidelines, 2nd Edition, Bat Conservation Trust.*

[http://www.bats.org.uk/publications/download.php/1127/Bat Surveys Good Practice Guidelines 2nd Edition.pdf](http://www.bats.org.uk/publications/download.php/1127/Bat_Surveys_Good_Practice_Guidelines_2nd_Edition.pdf)

This document covers on-shore single and multi-turbine developments and provides guidance on appropriate levels of survey and techniques for different situations. It does **not** cover offshore wind farms or micro turbines in detail.

Natural England, the Countryside Council for Wales and Scottish Natural Heritage (the SNCOs) have had input into the BCT Survey Guidelines and support their use. The SNCOs expect consultant ecologists to use their professional judgement, knowledge and experience of mitigation and compensation schemes, to tailor survey requirements to the development scheme, or other, in question. We recognise there will be situations where it is occasionally acceptable to undertake less than the minimum survey effort recommended to support a scheme and likewise, there will be situations which require more than the guidelines recommend. We will consider deviations from published guidance in mitigation and survey strategies where it is supported by a thorough ecologically relevant justification in the application and will judge each submission on an individual basis. If we are unable to agree with your proposals we will provide a summary of our assessment and highlight areas which need to be addressed.

Wind Farms

1. *Natural England Technical Information Note TIN051. Bats and onshore wind turbines. 2nd edition, February 2012.*

<http://publications.naturalengland.org.uk/file/490077>

This interim guidance is designed to help planners and wind turbine operators assess the potential adverse impacts of wind farms on bats.

2. Eurobats Publication No. 3: Guidelines for consideration of bats in wind farm projects

http://www.eurobats.org/publications/publication_series.htm

This guidance has been produced by the Advisory Committee to the *Eurobats Agreement* on bats and wind farms. It is based on evidence collected abroad, and includes some examples with characteristics that differ from those typical of the UK. Nevertheless, the *Eurobats* guidance provides a useful European context, within which Member States can produce their own more specific guidance focussing on local circumstances.

N.B. The *Eurobats* guidance proposes that the buffer surrounding woodland areas should be 200m, while TIN51 suggests a buffer zone of 50 m (from the nearest turbine blade tip). This is a *minimum* distance and, in some cases, the SNCOs may advise a greater stand-off distance. An example might be a proposed wind turbine site where a high risk, scarce species has been regularly recorded.

Single Large Wind Turbines

1. Natural England Technical Information Note TIN059. Bats and single large wind turbines: Joint Agencies interim guidance.

<http://publications.naturalengland.org.uk/file/96013>

This interim guidance is intended to deal with planning applications for single large wind turbines, which are greater than 250kW.

Micro-turbines

1. Scottish Natural Heritage Guidance Note. Micro renewables and the natural heritage. October 2009.

<http://www.snh.gov.uk/docs/A301202.pdf>

This guidance note seeks to describe and advise on the potential natural heritage impacts which some micro renewable technologies could have in certain circumstances.

Further guidance on small wind turbines and micro-turbines

There have been requests for further guidance to be issued by SNCOs specifically covering smaller wind turbines and micro-turbines. However, in the absence of a clear understanding of the potential adverse impacts of such installations, we would like to wait for the results of current research projects being undertaken in the UK, before issuing more detailed guidance. Although, these research projects are not due to complete for some time, we will update our guidance, as appropriate, when new information becomes available.

However, in the meantime it is recommended that potential impacts on bats from micro-turbines are assessed on a site by site basis. Surveys should be undertaken if it is

considered that there is likely to be a significant impact on bats, particularly when records suggest a roost is located in close proximity to the turbine and also falls under the other high risk categories as identified in the SNH guidance note.

Current wind turbine research

Wind Farms

Defra funded study, co-ordinated by Dr Fiona Mathews of Exeter University, investigating whether onshore wind farm developments have an impact on bat populations in England, Wales and Scotland. Due to report in 2013.

Mid-sized wind turbines

PhD studentship, co-ordinated by Dr Fiona Mathews of Exeter University, investigating the effects of mid-sized wind turbines on bats. Due to report in 2014.

Micro-turbines

PhD studentship, co-ordinated by Dr Kirsty Park of Stirling University, investigating the possible effects of micro-turbines on wildlife. For more information see: <http://www.sbes.stir.ac.uk/research/ecology/micro-turbines.html>

SNH, Natural England and CCW will produce more detailed guidance on surveying and monitoring of wind turbine sites once we have the results from the research projects outlined above. Although, these are not due to finish for some time, we will update our guidance in the light of any new information when possible.