

Senate Inquiry in Australia

Bird and Bird Habitats

Prepared January 27, 2011

Attention: [Lipshutz, David \(Sen S. Fielding\)](#)

Prepared by

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NOTICE TO READER

When ever possible, authoritative references are cited to support the assertions contained within this summary. This summary also contains statements and citations from other individuals and or organizations.

Every reasonable attempt was made to ensure the accuracy of this summary. Any errors or omissions contained within this summary are unintentional.

No financial compensation has been requested nor received for the compilation of this summary.

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This summary may be used and submitted by other individuals as required.

Due to time and resource constraints this summary does not detail all the references available.

While there is concern about risks to human health, there are many topics which lack authoritative research. Examples include the lack of research for the environment, wild life, animals, farm animals, economy, cost/benefit, viability, aquatic and marine life to name a few.

There is, however, evidence indicating a risk to birds and bird habitats.

Bird and bird habitat research is urgently required to determine authoritative regulations for safe setbacks and noise levels. Until this research is conducted, no further industrial wind turbine development should occur.

Based on the best available science, decision makers should give serious consideration about the risk to birds and bird habitats and not approve any industrial wind turbine facilities until authoritative research has been conducted.

Respectively submitted,

Carmen Krogh
Beth Harrington

Volunteer: Members of the Board, the Society for Wind Vigilance

The Society is an international federation of physicians, acousticians, engineers and other professionals urging the conduct of human health research to determine authoritative setbacks and noise levels before proceeding with further wind energy developments.

Please include this submission as part of the public record.

General Comments

It is noted that there is a lack of authoritative research regarding the impact to birds and bird habitat.

This is ignoring the precautionary principle. The wind energy industry frequently monitors bird kill and disruption of habitat, without mitigation, without restitution, without penalty. By the time the documentation of the rate of bird kills, including that of endangered species is available, it will be too late to repair the damage.

Based on the best available science which indicates a risk to Birds and Bird Habitats, decision makers should ban the siting of industrial wind turbine facilities, including transformer stations, transmission lines, in proximity of migratory bird corridors, wetlands and nesting grounds.

An August 2009 peer reviewed article states “Wind turbines are a new source of community noise to which relatively few people have been exposed...”¹ Given that the implementation of industrial wind turbines without the front end research to determine human health consequences, similar research is required before proceeding with development in migratory bird corridors, wetlands and nesting grounds. This front end peer reviewed and authoritative research is required before proceeding with a guideline. To date, there is sufficient scientific uncertainty to require invoking the precautionary principle until this is resolved.

Proceeding with more developments only repeats the mistakes made regarding the adverse health effects occurring in the general population exposed to wind energy projects.

A recent study states, “In general, current knowledge indicates that there should be precautionary avoidance of locating wind farms in regional or internationally important bird or bat areas and/or migration routes. Locations with high bird or bat use are not suitable for wind farms.”²

This long term study further states:

- “Large modern turbines of 1500 kW or more can have as much as, or even more collision fatalities than smaller turbines.
- The average number of collision fatalities in different European wind farms on land varies between a few birds up to 64 birds per turbine per year.
- Site selection can play an important role in limiting the number of collision fatalities.

- Actual observed collisions (thermal image intensifiers) were performed in The Netherlands (Winkelman 1992b). These results showed a remarkably high nocturnal collision probability of 1 in 40 passing birds (2.5%) at rotor height.
- An exhaustive study before the selection of future locations is a key factor to avoid deleterious impacts of wind farms on birds and bats.
- Cumulative negative impacts with an increasing number of wind turbines must be taken into account (Langston & Pullan 2003). This is developing especially along fixed bird migration corridors (coasts, mountain passes). More wind farms also means an extra pressure on top of the already existing sources of negative impact (power lines, traffic etc.).
- A number of environmental impact assessments (EIA) have important shortcomings because of the lack of data and time or the use of incomplete data (e.g. not covering the annual cycle). It is very important that EIA's are made independently or are at least evaluated independently. When important factors remain unclear and an indication exists for an important negative impact, the precautionary principle must be applied. A constructive working method is to map potential and no-go locations for wind energy in a certain country or region, based on all available information, long before concrete projects are planned.
- It is clear that if a wind farm could have an important negative impact on wildlife, landscape, etc., the obligation exists to look for alternatives first. In most cases there will always be less vulnerable locations or other alternatives for wind farms.”

Wind turbine visual effects such as shadow flicker may also cause visually induced adverse health effects in humans, such as annoyance and/or stress.^{3, 4, 5, 6, 7, 8, 9, 10} It is assumed that there is a similar risk that shadow flicker could cause disorientation and disruption to birds and bird habitat.

Until the authoritative research on visual risks to birds and bats, industrial wind turbines must not be sited in migratory bird corridors, wetlands and nesting grounds.

Audible wind turbine LFN is routinely perceptible to humans.

There is scientific uncertainty regarding the understanding of human response to infrasound.

“It is acknowledged that LFN may be one area of scientific uncertainty in the wind industry as a whole.”^{11, 12}

and

regarding wind turbine infrasound in particular: “...it is recognized that this may be an area of scientific uncertainty.”^{13, 14}

Indications are there is scientific uncertainty regarding the understanding of birds' response to low frequency / infrasound.

Buxton, in a literary comment raises concerns regarding low frequency and infrasound and their impact on birds "The adverse effects of low frequency noise (LFN) and infrasound are generally understood although not widely appreciated because by and large, up until recently most creatures do not encounter them for long periods of time or at levels that are perceived to be dangerously low"... "birds will often fail to return to a nest that has been disturbed even when eggs or young are present..." The wind industry has hitherto been slowly reactive rather than speedily proactive to the plight of birds and bats in relation to the problems caused by their turbines. The attitude always appeared to be one of first instance denial and it was not until overwhelming evidence was produced showing the mortality rates, that attempts were made to ameliorate the situation"... Being unable to see or hear the blades represents a very real danger and probably explains the high mortality rate at wind farms sited in frequently used flight or migration paths. The down draught and turbulence caused by the wind passing through the blades also plays a part in disturbance, injury and death rates." ¹⁵

Buxton continues "Birds and song birds in particular have to discriminate between their own and other species calls and songs. This need is an important aid to communication for mating, group bonding, feeding, danger awareness, flocking and at the other extreme, isolation for territorial requirements."

Another study notes "...As a matter of urgency, constraints must be put in place so that areas surrounding sensitive habitats of endangered and threatened species are clearly out of bounds to wind turbine development..." "When . . . an indication exists for an important negative impact, the precautionary principle must be applied..." ¹⁶

In May, 2009, Dr Albert Manville, Senior Wildlife Biologist with the Division of Migratory Bird Management (DMBM) of the U.S. Fish and Wildlife outlined concerns regarding wind turbines "the increasing height and increasing rotor-swept area putting turbines well within the zone of risk for migrating birds, not to mention impacts to birds during take-offs and landings..." and "the potential for single-night, mass mortality events when mass migration and inclement weather coincide, where weather ceilings force birds down well within rotor swept areas". ¹⁷

Stelling has produced two documents including a summary of Arran Lake's (Ontario) migratory species vulnerability. ¹⁸, ¹⁹

In Stelling's Environmental Bill of Rights submission to the Ministry of Environment, Stelling states "Several groups of birds appear to be the most susceptible to collision with wires, most notably waterfowl, shorebirds and raptors (Stout and Cornwell 1976, Curtis 1977, Anderson 1978, Enderson and Kirven

1979, NUS Corporation 1979, Olsen and Olsen 1980, Moorehead and Epstein 1985, Faanes 1987). Raptors are frequent victims of wire collisions (Enderson and Kirven 1979, Olsen and Olsen 1980). For example, overhead wires are believed to be one of the main causes of injury and death to Merlins¹⁹ (*Falco columbarius*) in Great Britain (Olsen and Olsen 1980). Waterfowl and shorebirds may show avoidance behaviour to turbines, but significant numbers have been known to collide with associated power lines, especially when located near wetlands (Anderson 1978, NUS Corporation 1979, Moorehead and Epstein 1985). At a power plant in Illinois, an estimated 400 birds each autumn (0.4% of the peak number present) were killed by colliding with overhead power lines; most of the known victims were Bluewinged Teal (*Anas discors*; Anderson 1978). Powerline strikes are the cause of up to 64% of collision fatalities for certain waterfowl species, but wires also take a toll on shorebirds. At Trinidad, California, more than 150 Red-necked Phalaropes (*Phalaropus lobatus*) were killed on 6 May 1969 by striking electric wires along the coast (Gerstenberg 1972).”²⁰

The National Audubon Society during Congressional Testimony on Wind Power testified that “Wind energy facilities can have detrimental impacts on birds, bats, and other wildlife in four fundamental ways:

1. Collision mortality
2. Loss or degradation of habitat
3. Disturbance and subsequent displacement from habitat
4. Disruption of ecological links”²¹

It was noted that “Currently, collision mortality is being assessed at only a small minority of the wind energy facilities in the country. In some regions, it has not been assessed at all”...”Development of wind power facilities results in destruction of habitat from support roads, storage and maintenance yards, turbine towers, and associated infrastructure”...”Disturbance from human activity and turbines may displace animals from the habitat. While this is seldom lethal, it may cause birds and other animals to abandon preferred habitat and seek lower-quality habitat elsewhere, where disturbance is less. This may result in reduced survival or reduced breeding productivity, which may cause lower or declining populations”...” Large wind energy facilities may interfere with the ability of birds and other wildlife to travel between feeding, wintering, and nesting sites.”²² ,

Some government officials, NGOs’, environmental organizations and other groups are expressing concern regarding bird and bird habitat. Some have expressed a precautionary approach is required. Some have requested moratoriums.

Comments include:

“...minimizing impacts effectively requires that the impacts be accurately predicted, verified, and mitigated. Sound project-level decisions regarding minimization of impacts require a comprehensive body of scientific research to

predict wildlife impacts, a process for gathering adequate information at the site-specific project level before and after construction, and a process for modifying projects effectively after problems arise.

Currently, there are no mandatory regulatory standards, and few state standards, regarding the design or siting of wind power facilities to reduce risks to birds and other wildlife. The U.S. Fish and Wildlife Service (FWS) and several states have published guidelines, but these are merely advisory in nature, and in most cases compliance is voluntary. Some federal land management agencies have adopted guidelines for wind power developments on public lands, but the guidelines fail to provide adequate measures for mitigating the risks to birds. “²³

Dr. David Suzuki is reported to have stated “...we've got to choose our sites so that we don't endanger wildlife. If there are aesthetic reasons, we've got to take that into account. If there are setbacks that are needed, we've got to take that into consideration”.²⁴

“The development of wind farms should be managed sensitively and framed within regional and local spatial planning guidelines. This should include development of national, regional and local wind targets, assessing high value habitats and identifying no-go areas for wind development. In this way, any environmental impacts and conflicts with other land or marine uses would be identified and minimised.”²⁵

Even the Premier of Ontario seemed to have second thoughts based on a report. “When Dalton McGuinty visited The Globe and Mail's editorial board earlier this year, one topic seemed to catch him off guard. How, the Ontario Premier was asked, could his government be considering putting wind turbines off the shores of Point Pelee, in Lake Erie's Pigeon Bay? As one of the most ecologically sensitive corners of the province, wasn't it the sort of place that should be deemed off limits for energy development? After broadly extolling the virtues of his Green Energy Act, Mr. McGuinty stumbled through an acknowledgment that he hadn't really given this specific issue much consideration. “You've raised something which I've not thought about,” he said.²⁶

Regarding the Wolfe Island, Ontario report regarding bird kills “...provincial officials certainly noticed the Wolfe Island numbers. In response to the May 2010 report, for example, Erin Cotnam of the Ontario Ministry of Natural Resources observed that the number of raptor and vulture fatalities—13 in the six-month period—were “among the highest” of any wind farm in the province (Cotnam, 2010). Environment Canada characterized the raptor fatalities as a “primary concern [that] merits continued, close monitoring” (Read, 2010).²⁷

In the US, “We need to take a cautionary approach,” Evans continued. “We're learning as we go with this technology. I think the important thing is that we go slowly until we know more about this technology. There is very little foresight into

maintaining bird populations 20 years out. It's very difficult to forecast that many years in advance." ²⁸

"...there is a lack of science investigating both the indirect impacts (disturbance, habitat fragmentation, etc.) and the cumulative impacts of multiple wind farms on the waterfowl and their habitat. DUC is calling on the Province to establish a moratorium on all wind turbines and renewable energy projects in areas providing continentally significant staging habitat for waterfowl and migratory birds. DUC has significant concerns with the means by which, and the rate at which, renewable energy projects are being implemented in and adjacent to critical, continentally significant staging habitat for waterfowl and migratory birds....." ²⁹

A comment from the British Wind Energy Association stated "Sensitive siting is key to wind energy development - we don't build wind farms in the middle of a motorway, and we certainly won't be building offshore wind farms in shipping lanes or on bird migration routes or feeding grounds! Just as onshore wind energy developments monitor proposed sites carefully for their suitability for development, so offshore wind farms are monitored - usually for two seasons to get a full idea of all the species that might be present." ³⁰

A resolution for a moratorium was requested by the Ontario Nature – Federation of Ontario Naturalists

"Now Therefore Be it resolved that Ontario Nature – Federation of Ontario Naturalists:

- (1) calls upon the government of Ontario to place a moratorium on wind farm development within 5 km of known significance to migrating birds and National Parks, Provincial Parks, and Important Bird Areas, until thorough, multi-year radar studies of bird migration are conducted at proposed development sites; and
- (2) urges the government to protect these sites from wind farm development if studies determine that they have significant bird migration concentrations, for example, of over 100,000 birds in a season or are found to be situated within major migratory pathways." ³¹

"Leading conservation groups say wind farm doesn't belong in Important Bird Area

November 22, 2010 (Ottawa and Toronto) – Nature Canada and Ontario Nature are urging Gilead Power Corporation not to build a wind turbine farm in the heart of the globally significant Prince Edward County South Shore Important Bird Area." ³²

In a letter to John Gerretsen, former Minister of the Environment, Evans stated:

“The Wolfe Island raptor mortality to date suggests that commercial wind development in the grassland-shrubland region proximal to the entire northeastern Lake Ontario and upper St. Lawrence River region may have elevated raptor impacts. The precise area of elevated raptor impacts is difficult to demarcate, but our 40 years of experience in the region suggests the red areas in the map below would be involved.

It will be several more years before winter raptor numbers peak again on Wolfe Island enabling the extent of raptor impacts during such incursions to be documented. In the meantime, there are at least 400 1.5 MW or greater MW wind turbines proposed and in active siting consideration within this periodically raptor-laden grassland region proximal to northeastern Lake Ontario and the upper St. Lawrence River valley.⁵ The size and juxtaposition of this grassland complex to the important upper St. Lawrence River/Lake Ontario Coastal migration corridor may very well equate to an avian and bat habitat of national significance.

This area shown in red in Fig. 1 also holds an important population of grassland birds in northeastern North America, including the highest breeding densities of Henslow's Sparrow *Ammodramus henslowii* and Upland Sandpiper *Bartramia longicauda*.⁶ We note that both these species are in steep decline in this region of the continent⁷ and Upland Sandpiper was recently documented as a fatality at the Wolfe Island Wind Project.”³³

The United States Department of the Interior, Fish and Wildlife Service advised planners:

"Wind energy facilities can adversely impact wildlife, especially birds and bats, and their habitats. As facilities with larger turbines are built, the cumulative effects of this rapidly growing industry may initiate or contribute to the decline of some wildlife populations. The potential harm to these populations from an additional source of mortality makes careful evaluation of proposed facilities essential".³⁴

The US Fish and Wildlife Service (USFWS) further elaborated:

"1. Avoid placing turbines in documented locations of any species of wildlife, fish, or plant protected under the Federal Endangered Species Act.

2. Avoid locating turbines in known local bird migration pathways or in areas where birds are highly concentrated. . . . Examples of high concentration areas for birds are wetlands, State or Federal refuges [sanctuaries], and staging areas. . . . Avoid known daily movement flyways (e.g., between roosting and feeding areas).

3. Avoid placing turbines near known bat hibernation, breeding, and maternity/nursery colonies, in migration corridors, or in flight paths between colonies and feeding areas." ³⁵

The USFWS guidelines were based on peer-reviewed scientific avian studies written by biologists: Orloff and Flannery 1992, Leddy et al. 1999, Woodward et al. 2001, Braun et al. 2002, Hunt 2002 as well as studies of bats: Keeley et al. 2001, Johnson et al. 2002, Johnson et al. 2003, Manes et al. 2002, and Manville 2003.

Similarly, the United States Department of the Interior, Fish and Wildlife Service has also advised planners:

Dr. Scott Petrie, a biologist from Ontario with Bird Studies Canada says "the current rush for approvals and substantial competition between companies has resulted in the consideration of sites that are critically important for migratory birds and bats, e.g., closely associated with Ramsar Sites, Important Bird Areas, Biosphere Reserves, National Wildlife Areas, Provincial Parks, etc."

He further states "In most instances there has been an inadequate use of existing scientific literature pertaining to the potential impacts of turbines on wildlife (waterfowl, bats, passerines [songbirds]). There is ample European literature on the subject which has not been adequately utilized in the planning process." ³⁶

Dr Mark Avery, the Royal Society for Protection of Birds (RSPB) Conservation Director, said: 'We have been appealing to the government for many years to publish maps like these primarily to help developers avoid sites that are important to wildlife....The RSPB backs the expansion of the renewables' industry, so long as developments do not threaten rare and important wildlife habitats or significant populations of wild birds.' ³⁷

The Nature Canada Position Statement declares:

“The main potentially detrimental effects of wind farms on birds, as identified in BirdLife International’s position statement on wind farms and birds are:

1. Collision with the moving turbine blades, with the turbine tower or associated infrastructure such as overhead powerlines, or the wake behind the rotors causing injury, leading to direct mortality.
2. Disturbance displacement from around the turbines or exclusion from the whole wind farm.
3. Reduced breeding productivity or reduced survival may result if birds are displaced from preferred habitat and are unable to find suitable alternatives. Disturbance may be caused by the presence of the turbines, and/or by maintenance vehicles/vessels and people, as well as during the construction of wind farms.
4. Barriers to movement disrupting ecological links between feeding, wintering, breeding and moulting areas and extended flights around wind clusters, leading to increasing energy demand potentially reducing fitness.
5. Large individual wind farms, or the cumulative effect of multiple wind farms, are the main concerns.
6. Change to or loss of habitat due to wind turbines and associated infrastructure.”³⁸

Media are reporting the growing evidence that biologists have identified risk to migratory birds and habitats, including collision mortality such as that experienced by bats and raptors.

The Contra Costa Times reports that the “largest wind energy producer in the Altamont Pass area of eastern Alameda and Contra Costa counties has agreed to replace 2,400 wind turbines within four years and pay \$2.5 million in a legal settlement to reduce deaths of eagles, hawks and other raptors hacked by turbine blades. The settlement between NextEra Energy Resources, the state, and several environmental groups was announced Monday by the state Attorney General Jerry Brown... The settlement resolves a debate about whether the company was making sufficient progress toward a previous legal pledge to reduce bird kills by 50 percent from 2007 to 2010.”³⁹

The Fraser Institute noted that “Outrage erupted worldwide in the spring of 2008 following the deaths of 1,606 ducks that alighted on a tailings pond in northern Alberta, leading to the criminal prosecution of Syncrude Canada Ltd., one of the largest producers of crude oil from Canada’s oil sands (Syncrude, n.d.). Yet the fact that a great many more birds and bats are routinely mangled by wind turbine blades at wind farms draws very little attention. This double standard highlights the widespread misperception that so-called “renewable” energy sources do not demand environmental trade-offs” and that “Somebody has given the wind industry a get-out-of-jail-free card”⁴⁰

The Toronto Globe and Mail reported “Shockingly high” numbers of bird and bat deaths caused by one of Canada’s biggest wind farms should serve as a warning to planners of other projects that may be built in crucial wildlife zones...” The article goes on to quote “The monitoring reveals shockingly high numbers of fatalities of both birds and bats,” said Ted Cheskey, manager of bird conservation programs at Nature Canada. He said the figures underline what his organization has been arguing all along, that “there should not be wind turbines put in important bird areas or migratory corridors.”⁴¹

Internationally, concerns are being expressed about industrial wind turbine and the risks associated with large raptors, bats, and birds. A brief snapshot of references taken from the Save the Eagles web site include:⁴²

“Spanish Birdlife (Sociedad Española de Ornitología - SEO/Birdlife) to warn that wind farms located less than 15 km from large raptors' nests may have detrimental effects on these birds (read : lethal or crippling collisions) - Directives For Assessing The Impact Of Wind Farms On Birds And Bats (In Spanish : Directrices Para La Evaluacion Del Impacto De Los Parques Eolicos En Aves Y Murcielagos) - SEO/Birdlife (Dec. 2008).

German ornithologists recommend a setback of 3 to 6 km around eagle nest sites,
- it isn't ample enough: recent radio tracking studies have shown that Lesser Spotted Eagles have *“a much greater home range than previously believed.”*

Even the Royal Society for the Protection of Birds (RSPB), which is campaigning vehemently in favour of wind farms - admits that they should not be built closer than 5 km from white-tailed eagles' nests, and 2.5 km from golden eagles' nests (though in this case it should really be 6 km, for the 2.5 km radius only comprises 50% of the eagles' flights. The RSPB may have chosen 2.5 km because of its close ties with the wind industry, which has many projects within eagle breeding territories in Scotland.

Says the RSPB : *“Golden Eagles are within home range core areas (2.5km radii) for 50% of the time, and avoidance of these will reduce risk of collision by territorial adults as well as minimising the impact of indirect habitat loss.”*

The California Energy Commission stated “...well over 10,000 raptors at the Altamont over 20 years, including 2,000 to 3,000 golden eagles”...All kinds of mitigation measures were implemented at the Altamont, including the poisoning of live prey (rabbits). None of them worked, and the poisoning backfired into more eagle deaths. [Range Management Practices To Reduce Wind Turbine Impacts On Burrowing Owls And Other Raptors In The Altamont Pass Wind Resource Area, California - California Energy Commission, PIER Final Project

Report - Dr Smallwood et al. (October 2009)]:

" Wind turbines - a new permanent danger. The number of victims at wind farms is undoubtedly higher than officially known. The plans to greatly increase the numbers of these installations in Brandenburg and elsewhere can only be viewed with the greatest concern as far as the Lesser Spotted Eagle is concerned. Wind farms in the USA claim thousands of victims annually. As with the help of ST studies it is now known that the Lesser Spotted Eagles have a much greater home range than previously believed, the protective belt around known nest sites of 3 or 6 km only partly helps to solve the problem. Moreover, even these minimum stand-off distances are often not respected"

The post construction monitoring report by a wind developer in Ontario, reported that:

"Correcting seasonally for searcher efficiency, scavenger and other removal rates, and the percent area searched, the 12 raptor/vulture and 88 other bird carcasses recovered represent approximately 602 bird fatalities over the course of this Reporting Period.

The estimated total bird mortality for the Reporting Period is 6.99 birds/turbine (3.04 birds/MW). The mortality rate for the six-month Reporting Period at the EcoPower® Centre, at 3.04 birds per MW, is consistent with the results in nearby New York and other studies summarized by Arnett et al. (2007)." ⁴³

If these rates are "...consistent with rates observed elsewhere in Ontario (Stantec, unpublished data)", ⁴⁴ then there is a serious problems when the numbers of kills are correlated with the intended goal of the government of Ontario to significantly increase the number of operating wind turbines.

A bird kill report from Germany indicates 118 species with 865 known bird kills. ⁴⁵

Some indicate a flaw in the count process since by the time a count is made, scavengers have destroyed the evidence. To avoid this, 7/24 would be required at key times of the year in order to achieve more precise monitoring.

Conclusions:

There is enough evidence indicating a serious risk to birds and bird habitat with industrial wind turbines.

Nature and conservation groups are expressing their concern about birds and bird habitat being at risk from industrial wind turbine facilities – including transformer stations and transmission lines.

Decision makers should not allow industrial wind turbines near migratory bird corridors, wetlands, nesting grounds or any area where birds are placed at risk.

Authoritative and peer reviewed research must be undertaken before allowing industrial wind development near migratory bird corridors, wetlands, nesting grounds or any area where birds are placed at risk. This must be accompanied by base line analysis 3 to 5 years prior to establishing an industrial wind turbine facility.

Until the risks are rigorously assessed with long term studies prior to installation, the precautionary principle must be invoked and industrial wind developments should not be allowed near migratory bird corridors, wetlands, nesting grounds or any area where birds are placed at risk..

¹ Pedersen, E., R. Bakker, J. Bouma and F van den Berg, 2009. Response To Noise From Modern Wind Farms in The Netherlands. Journal of the Acoustical Society of America

² THE BELGIAN RESEARCH INSTITUTE STUDY, Belgium. Joris Everaert and Eckhart Kuijken of the Belgian Research Institute for Nature and Forest Wind turbines and birds in Flanders (Belgium): Preliminary summary of the mortality research results 2007

³ National Research Council (NRC). Environmental Impacts of Wind-Energy Projects, 2007 NRC, Washington, DC

⁴ Minnesota Department of Health (MDH) 2009 Public Health Impacts of Wind Turbines

⁵ Pedersen et al., 2008, Project WINDFARM perception Visual and acoustic impact of wind turbine farms on residents

⁶ Copes et al, Wind Turbines And Environmental Assessment, National Collaborating Centre for Environmental Health, June 23, 2009

⁷ Copes, R. and K. Rideout. Wind Turbines and Health: A Review of Evidence. Ontario Agency for Health Protection and Promotion, September 2009

⁸ Copes, Ray MD, MSc, Wind Turbines in Ontario: Hazard or Outrage?, Ontario Agency for Health Protection and Promotion, January 2010

⁹ Rideout K, Copes R, Bos C. Wind turbines and health. Vancouver: National Collaborating Centre for Environmental Health; 2010 Jan [cited 2010 June 3]. Available from: http://www.nceh.ca/files/Wind_Turbines_January_2010.pdf.

¹⁰ Environment Protection and Heritage Council (EPHC), National Wind Farm Development Guidelines DRAFT - JULY 2010

¹¹ Ostrander Point Wind Energy Park – Design And Operations Report Draft (REA) s prepared by Stantec Consulting Ltd. September 2010

¹² Jacques Whitford Stantec, Byran Wind Project Environment Review Report of August 25, 2009 Project Number 1038660

¹³ Ostrander Point Wind Energy Park – Design And Operations Report Draft (REA) s prepared by Stantec Consulting Ltd. September 2010

¹⁴ Jacques Whitford Stantec, Byran Wind Project Environment Review Report of August 25, 2009 Project Number 1038660

¹⁵ Low Frequency Noise and Infrasound (Some possible causes and effects upon land-based animals and freshwater creatures) A literary comment By Ivan Buxton 2006 (Reference attached to this submission)

¹⁶ Joris Everaert and Eckhart Kuijken, Belgian Research Institute for Nature, Wind turbines and birds in Flanders (Belgium): Preliminary summary of the mortality research results 2007.

¹⁷ FRIENDS OF ARRAN LAKE a member of WIND CONCERNS ONTARIO. Submission to the Environmental Registry Renewable Energy Approval Requirements REFERENCE MOE registry number: 010-6516 MNR registry number: 010-6708 Compiled by Keith Stelling, BA, MA, (McMaster) MNIMH, Dip Phyt, MCPP (England) 10 July 2009

¹⁸ FRIENDS OF ARRAN LAKE a member of WIND CONCERNS ONTARIO. Submission to the Environmental Registry Renewable Energy Approval Requirements REFERENCE MOE registry number: 010-6516 MNR registry number: 010-6708 Compiled by Keith Stelling, BA, MA, (McMaster) MNIMH, Dip Phyt, MCPP (England) 10 July 2009

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- ¹⁹ Arran Lake Wetlands Complex: a study of a sensitive wildlife habitat under threat Compiled by: Keith Stelling, BA (Hons), MA (McMaster), MNIMH, Dip Phyt, MCPP (England), 18 October, 2008
- ²⁰ FRIENDS OF ARRAN LAKE a member of WIND CONCERNS ONTARIO. Submission to the Environmental Registry Renewable Energy Approval Requirements REFERENCE MOE registry number: 010-6516 MNR registry number: 010-6708 Compiled by Keith Stelling, BA, MA, (McMaster) MNIMH, Dip Phyt, MCPP (England) 10 July 2009
- ²¹ Audubon Congressional Testimony on Wind Power Testimony of Mike Daulton, Director of Conservation Policy, National Audubon Society, Before the Committee on Natural Resources Subcommittee on Fisheries, Wildlife and Oceans, Impacts of Wind Turbines on Birds and Bats, May 1, 2007
- ²² *ibid*
- ²³ Testimony of Mike Daulton, Director of Conservation Policy National Audubon Society Before the Committee on Natural Resources Subcommittee on Fisheries, Wildlife and Oceans
- ²⁴ Dr. David Suzuki, Kingston Whig Standard dated June 21, 2008
- ²⁵ WWF(US),(CANADA), POSITION ON WIND POWER
- ²⁶ Globe and Mail, Published Monday, Sep. 06, 2010 7:08PM EDT
- ²⁷ Birds, bats and the trade-offs of Wind power, Katz, D., Fraser Institute
- ²⁸ Kim Kaufman, Black Swamp Bird Observatory Ohio USA, Press Release Dec.13, 2010
- ²⁹ Ducks Unlimited Canada Newsletter EASTERN REGION (Ontario) Volume 31, Number 4, 2010
Impacts of wind turbines on waterfowl
- ³⁰ British Wind Industry Association <http://www.bwea.com/offshore/round2.html>
- ³¹ Resolution accepted by members at the Annual General Meeting of Ontario Nature, May 29, 2010 Priority Resolution on: Protecting Bird Migration Areas
- ³² http://www.naturecanada.ca/newsroom_nov_22_10_ostrander.asp
- ³³ Letter to Minister of Environment, John Gerretsen, from William R. Evans, August 12, 2010,
- ³⁴ U.S. Department of the Interior Fish and Wildlife Service, *Service Interim Guidelines on Avoiding and Minimizing Wildlife Impacts from Wind Turbines*, Letter to Regional Directors, Regions 1-7, May 13, 2003.
- ³⁵ U.S. Department of the Interior Fish and Wildlife Service, *Service Interim Guidelines on Avoiding and Minimizing Wildlife Impacts from Wind Turbines*, Letter to Regional Directors, Regions 1-7, May 13, 2003.
- ³⁶ From an email from Dr. Scott Petrie sent March 15, 2008 to Harry Verhey of the Chatham Kent Wind Action Group for presentation at the Kent Council meeting of March 25 2008. Dr. Petrie himself addressed the council on February 11, 2008.
- ³⁷ Red zone warning to wind farm firms; Avery, Dr. Mark, <http://www.rspb.org.uk/>
- ³⁸ M Thomsen & H. Köster, December 2004 <http://bergenhusen.nabu.de/bericht/VoegelRegEnergien.pdf>, The Position Policy of Nature Canada with regard to wind energy development in Canada
- ³⁹ Altamont wind energy company to pay \$2.5 million and replace turbines to reduce raptor deaths, By Denis Cuff, Contra Costa Times http://www.contracostatimes.com/news/ci_16790686?nclick_check=1
- ⁴⁰ Birds, bats, and the trade-offs of wind power, Fraser Forum July/August 2010 by Diane Katz www.fraserinstitute.org
- ⁴¹ Globe and Mail, Windfarm turbines deadly for birds, bats, by Richard Blackwell, Wednesday, Jun. 09, 2010
- ⁴² Mark Duchamp, Save the Eagles web site save.the.eagles@gmail.com
- ⁴³ 602 bird fatalities including 12 raptor/vultures, Wolfe Island Facility, Transalta <http://www.transalta.com/facilities/plants-operation/wolfe-island/monitoring>
- ⁴⁴ *ibid*
- ⁴⁵ Vogelverluste an Windenergieanlagen in Deutschland, Daten aus der zentralen, undkartei der Staatlichen Vogelschutzwarte, im Landesumweltamt Brandenburg, zusammengestellt: Tobias Dürr; Stand vom: 27. Juli 2009