



# Let's talk about Wind Energy

**The Canadian Wind Energy Association  
(CanWEA)**

**October 2009**



**canwea**

CANADIAN WIND  
ENERGY ASSOCIATION

ASSOCIATION CANADIENNE  
DE L'ÉNERGIE ÉOLIENNE

# About CanWEA

CanWEA is the voice of Canada's wind energy industry, actively promoting the responsible and sustainable growth of wind energy on behalf of its more than 450 members. A national non-profit association, CanWEA serves as Canada's leading source of credible information about wind energy and its social, economic and environmental benefits. To join other global leaders in the wind energy industry, CanWEA believes Canada can and must reach its target of producing 20 per cent or more of the country's electricity from wind by 2025. The document *Wind Vision 2025 – Powering Canada's Future* is available at [www.canwea.ca](http://www.canwea.ca).



# Wind energy in Canada

## **Wind energy is a well-established form of electrical generation around the world.**

- There are more than 80,000 wind turbines installed and operating worldwide
- There are more than 24,000 wind turbines installed and operating in North America
- The vast majority of people have a positive and productive experience living near wind turbines

## **Wind energy is still a relatively new technology in Canada.**

- As an industry, our responsibility is to provide answers to questions on the basis of factual, independent, peer-reviewed knowledge
- We're bringing a new, open approach to energy development in Canada based on respectful dialogue and responsible action
- As the voice of the wind energy industry in Canada, CanWEA actively promotes the responsible and sustainable growth of wind power throughout Canada

# Wind turbines and human health

## General Background:

Three kinds of sound are emitted by wind turbines:

- infrasound (oscillation frequencies less than approximately 10-20 Hz)
  - low frequency sound of approximately 10-200 Hz
  - the fluctuating aerodynamic “swoosh” from the turbine blades which is in the mid-frequency range, approximately 500-1000 Hz
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- The infrasound emitted from wind turbines is well below the audible threshold
  - People often use the term infrasound incorrectly when they are actually referring to low frequency sounds
  - The low frequency noise emitted by spinning wind turbines could possibly be annoying to some when winds are unusually turbulent, but there is no evidence this level of noise could be harmful to health
  - If these noise levels were harmful, city dwelling would be impossible due to the similar levels of ambient noise normally present in urban environments

# Wind turbines and human health (cont'd)

## What we know:

- A vast amount of scientific literature exists on sound and human health
- This global body of work clearly indicates that there is nothing unique about the sound and vibration from wind turbines and that there is no direct physiological impact on human health
- There is no reason to believe, based on the levels and frequencies of the sounds and vibrations and the many years of experience with sound exposures in occupational settings, that the sounds from wind turbines could have direct adverse health consequences

# Wind turbines and agricultural practices

## What we know:

- Wind energy represents a significant opportunity for landowners and farmers to diversify their land use in ways that work in harmony with their traditional agricultural practices
- Turbines occupy less than 4% of the land, leaving the rest for traditional uses (growing crops, raising cattle etc)
- Annual income from turbines help support farmers (as a percentage of gross revenues) in the form of land lease payments
- Payments vary project to project, but length of land lease payments are typically for 20 years
- For example, on a proposed project on Manitoulin Island, the developer expects to “pay participating landowners about \$8,000 annually for each turbine on their property” over the 20 year period and anticipate that in total “about \$7.5 million will be paid to the landowners.” (The Sudbury Star, August 22nd, 2009)

# Cost Competitiveness of wind energy

## What we know:

- While the costs of generating electricity from conventional energy sources are likely to increase in the years ahead, it is expected that the costs of wind generation will fall or remain stable as technological advances continue within the industry.
- ICF International conducted a study for CanWEA comparing the future generating costs of different electricity generating technologies. They concluded that even without a carbon price, a wind farm constructed in 2025 would produce electricity for a lower cost than electricity generated from peaking type natural gas, hydro, and coal plants that utilized carbon capture and storage
- In addition to its improving cost competitiveness, wind offers investors another valuable benefit – certainty with respect to future costs

## What we do:

- Encourage putting a value on wind's environmental attributes
- Continue working with the federal government to expand and extend the ecoENERGY for Renewable Power program (eRPP)

# Reliability

## What we know:

- Wind farms must adhere to strict “grid codes” that ensure they contribute to overall grid stability and reliability
- Wind works well as part of an integrated electricity grid, particularly if it has substantial hydroelectric generation as is the case in Canada
- Wide geographic dispersal of wind farms, along with good wind forecasting, smoothes fluctuations and makes it easier to integrate into the electric grid
- In most cases, variations in the wind-generated supply are smaller than those in the demand for electricity
- Consensus: we can integrate at least 20% and maintain system reliability

## What we do:

- Work with utilities on grid codes and wind integration techniques
- Sharing utility experience and knowledge gained from grid integration studies in Canada and the U.S

# Wind turbines and birds

## What we know:

- Wind turbines can potentially have impacts on birds through collisions and habitat disruption
- The average is approximately 2 birds per year per turbine
- This is much less than impacts from buildings, house cats or the climatic changes that are impacting bird habitats
- The National Audubon Society has stated that it “strongly supports wind power as a clean alternative energy source that reduces the threat of global warming”
- The key is proper wind farm siting and understanding avian behaviour
- All wind farms must undergo a thorough environmental review process (at the provincial and, in some cases, federal level). This ensures potential impacts are avoided or minimized, including identifying any requirements for operational phase obligations

# Wind turbines and bats

## What we know:

- Wind industry sponsored a recent study that looked into the high number of observed migratory bat fatalities at one wind farm in Alberta
- The study indicated that bats may suffer from *barotrauma* (damage to body tissue caused by pressure changes) when flying through low pressure areas in a wind turbine's wake
- Higher than normal number of fatalities have been observed at two wind farms in North America – elsewhere, bat fatalities are very low
- Mitigation strategies can greatly reduce impacts – one study showed a 52% reduction in bat fatalities when the cut-in wind speed of the turbines was increased
- Members of the wind industry actively participate in the Bat and Wind Energy Cooperative that is currently researching bat behaviour and possible mitigation strategies

# Property values

## What we know:

- CanWEA is ready, willing and able to assist with the collection and assessment of the latest research on this topic
- A comprehensive study by Renewable Energy Policy Project (REPP) looked at results of property value impacts of many wind farms across the United States. It concluded that there was no evidence that property values decreased as a result of wind farms and that property values actually increased more quickly than they did in comparable communities

# Visual impacts

## What we know:

- “Beauty is in the eye of the beholder” – this is an aesthetic issue
- Early consultation and engagement are key to community acceptance
- There are many tools available to assist developers and the community in designing wind projects that minimizes visual impacts

## What we do:

- Encourage early and frequent consultations between developers and communities using tools to assist visualisation
- Encourage people to visit existing wind farms and talk with leaders in those communities

# Safety

## What we know:

- When ice builds up on a blade, the turbine's control system shuts down the turbine until the ice melts or drops to the base of the turbine
- Some accidents have occurred with older turbine technology where proper maintenance procedures were not followed
- If a blade does fail (for example, from a lightning strike), it is designed to remain attached while the turbine shuts down

## What we do:

- Encourage proper maintenance procedures and schedules are followed on the turbines
- CanWEA recommends setbacks from roads and public access areas of blade length + 10 metres
- CanWEA has developed best practice documents for siting wind turbines with respect to sound
- Assist in developing regulations that allow for a balanced approach to the development of wind energy projects and the sustainability of the wind industry in Canada.

# Radar and telecom equipment

## What we know:

- Experience in Europe and U.S. has shown that wind turbines can easily and safely coexist with all types of radar and radio installations
- Very few documented cases of interference with television or telephones In certain circumstances, wind turbines can affect radio, telecom, radar or seismoacoustic systems

## What we do:

- Consult at an early stage with relevant authorities to ensure any potential impacts are either avoided or mitigated
- CanWEA and the Radio Advisory Board of Canada (RABC) issued guidelines to help determine early in the process if a potential site may interfere with any of these installations

# Turbine lighting

## What we know:

- As with all tall structures, turbines must be properly lit according to Transport Canada standards
- Lighting has to: a) provide sufficient warning to pilots, b) not attract birds, c) not hinder night sky viewing and d) not be a visual nuisance

## What we do:

- CanWEA worked with Transport Canada and others (pilots association, Canadian Wildlife Service, skywatcher groups) to develop standards that addressed a wide range of situations
- Result was CAR 621.19 Standard that requires red flashing lights spaced at least every 900 meters on turbines around the perimeter of the wind farm
- System ensures pilot safety, minimal bird impacts and minimal impacts on stargazers, while remaining unobtrusive for communities

# Shadow flicker

## What we know:

- Turbines rotate at 16-18 revolutions per minute and flashes occur once per second for a three-blade turbine
- Effect occurs only when: a) sun is low enough, b) the turbine shadow falls on a residence, and c) it is not cloudy
- Easily modeled as part of the wind farm design process
- No evidence that this has any health impact on humans or animals
- No guidelines currently in place in Canada, but common practice follows German model that allows for 30 hours of incidence per year under real conditions

## What we do:

- Promote awareness of issue and encourage consultations between promoters and adjacent landowners

# Stray voltage

## What we know:

- Most cases of “stray voltage” occur when there is either:
  - Improper grounding of on-site equipment (in which case it is an issue with on-site wiring)
  - A change in current patterns on the distribution line, from generation or load, that exposes a preexisting condition (in which case it is an issue with the distribution utility, not with the generator or load)
- The wind turbines are often mistaken as the source of the problem because of their prominence
- All wind turbines must fully comply with utility requirements to ensure that the electricity they supply is compliant with local grid standards

## What we do:

- Encourage on-site inspection for grounding problems, or examination of power quality issues with distribution utility

# Summary

- **Wind energy is a well-established form of electrical generation around the world.**
  - There are more than 80,000 wind turbines installed and operating worldwide
  - There are more than 24,000 wind turbines installed and operating in North America
  - The vast majority of people say they have a positive and productive experience living near wind turbines
- **We welcome open discussion about our industry**
  - Need to base discussions on solid, evidence-based facts
- **Familiarity breeds comfort**
  - Open communications can resolve many issues
  - CanWEA and members working to establish sound basis for discussion, and create effective communications tools

# Selected References

- **Audible sound**
  - “Wind Turbines and Sound: Review and Best Practice Guidelines”, HGC Engineering, February 2007 - [http://www.canwea.ca/Environmental\\_Issues.cfm](http://www.canwea.ca/Environmental_Issues.cfm)
  - CanWEA Fact Sheet: “Visual and sound - The sights and sounds of wind”  
[http://www.canwea.ca/Fact\\_Sheets\\_eng.cfm](http://www.canwea.ca/Fact_Sheets_eng.cfm)
  - For detailed information, see *CanWEA Paper: Addressing concerns about sound*

# Selected References

- **Wind turbines and human health**

- “Infrasound from Wind Turbines – Fact, Fiction or Deception?” Geoff Leventhall, Vol. 34 No.2 (2006) Canadian Acoustics [www.wind.appstate.edu/reports/06-06Leventhall-Infras-WT-CanAcoustics2.pdf](http://www.wind.appstate.edu/reports/06-06Leventhall-Infras-WT-CanAcoustics2.pdf)
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- “Wind Turbines and Birds: A Guidance Document for Environmental Assessment - Final Document and Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds”, Canadian Wildlife Service,  
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<http://www.ncl.ac.uk/press.office/press.release/content.phtml?ref=1222791170>
- CanWEA Fact Sheet: Wildlife: Birds, bats and wind energy  
[http://www.canwea.ca/Fact\\_Sheets\\_eng.cfm](http://www.canwea.ca/Fact_Sheets_eng.cfm)

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- “The Effect Of Wind Development On Local Property Values“ Renewable Energy Policy Project, May 2003 - [http://www.crest.org/articles/static/1/binaries/wind\\_online\\_final.pdf](http://www.crest.org/articles/static/1/binaries/wind_online_final.pdf)

- **Safety:**

- “Recommendations for Risk Assessments of Ice Throw and Blade Failure in Ontario”, Garrad Hassan, May 2007 [http://canwea.com/images/uploads/File/GH-RiskAssessment-38079or01a\(1\).pdf](http://canwea.com/images/uploads/File/GH-RiskAssessment-38079or01a(1).pdf)

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- **Interference with telecommunications**

- “Technical Information on the Assessment of the Potential Impact of Wind Turbines on Radio Communication, Radar and Seismoacoustic Systems”, Radio Advisory Board of Canada (RABC) and CanWEA, April 2007

[http://www.canwea.ca/Standards\\_and\\_Technical.cfm](http://www.canwea.ca/Standards_and_Technical.cfm)

- **Lighting**

- “Obstruction Marking and Lighting Standards”, Standard CAR 621.19, Transport Canada , Chapter 12: Wind Turbines and Wind Turbine Farms. Contact Eduard Alf :

[eduard.alf@tc.gc.ca](mailto:eduard.alf@tc.gc.ca)

- **Shadow flicker**

- Overview of shadow flicker and relevant standards:

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- **Reliability:**

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- Analysis of the Impacts of Large-Scale Wind Generation on the Ontario Electricity System, April 2005; [http://www.uwig.org/IESO\\_Study\\_final\\_document1.pdf](http://www.uwig.org/IESO_Study_final_document1.pdf)
- For a listing of utility wind integration studies prepared by the Utility Wind Interest Group (UWIG): <http://www.uwig.org/opimpactsdocs.html>
- See CanWEA WindVision 2025 Backgrounder: Section 8 - *Wind Energy is a Reliable Source of Energy* [canwea.com/images/uploads/File/Windvision\\_backgrounder\\_e.pdf](http://canwea.com/images/uploads/File/Windvision_backgrounder_e.pdf)

Wind: Canada's infinite source of clean energy.



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- **Economics:**

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