Wind Power

Industry Update

Presented by
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HATCH™

Agenda

- Brief introduction to wind power:
  - - Technology description
  - - Latest advances in technology
  - - World wide statistics
- Current issues and challenges:
  - - Pros and Cons of wind power
  - - Health and Environment issues
  - - Grid and Integration issues
  - - Economic and Political issues
- Conclusion:
  - - Looking forward: Alberta, Canada and beyond
  - - Question and answer period

Technology – Turbine components

Rotor

Hub

Blades

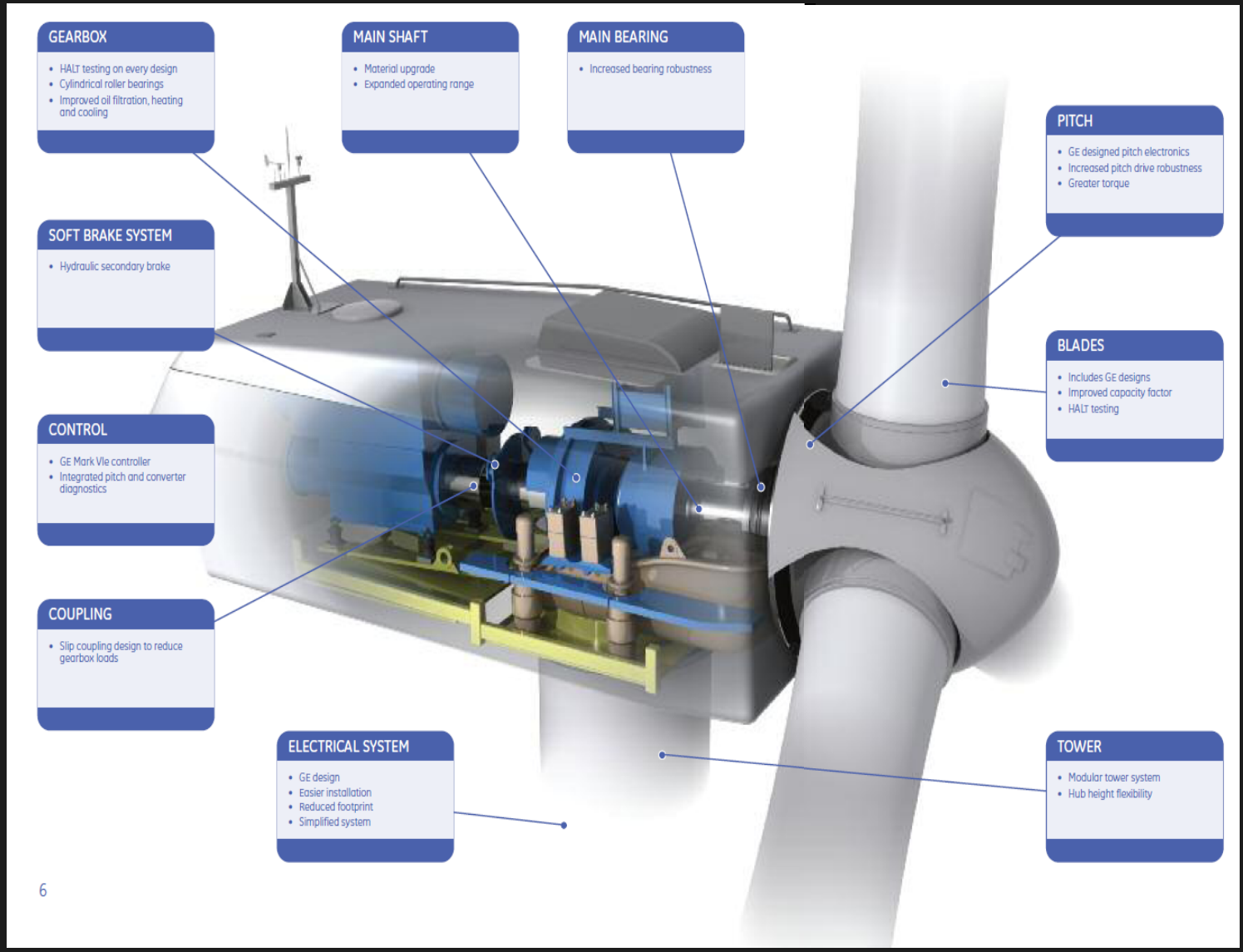
Nacelle

Tower
3-4 sections

Step-up
Transformer

Technology – Turbine components

Technology – Turbine Components



Technology – Turbine Components

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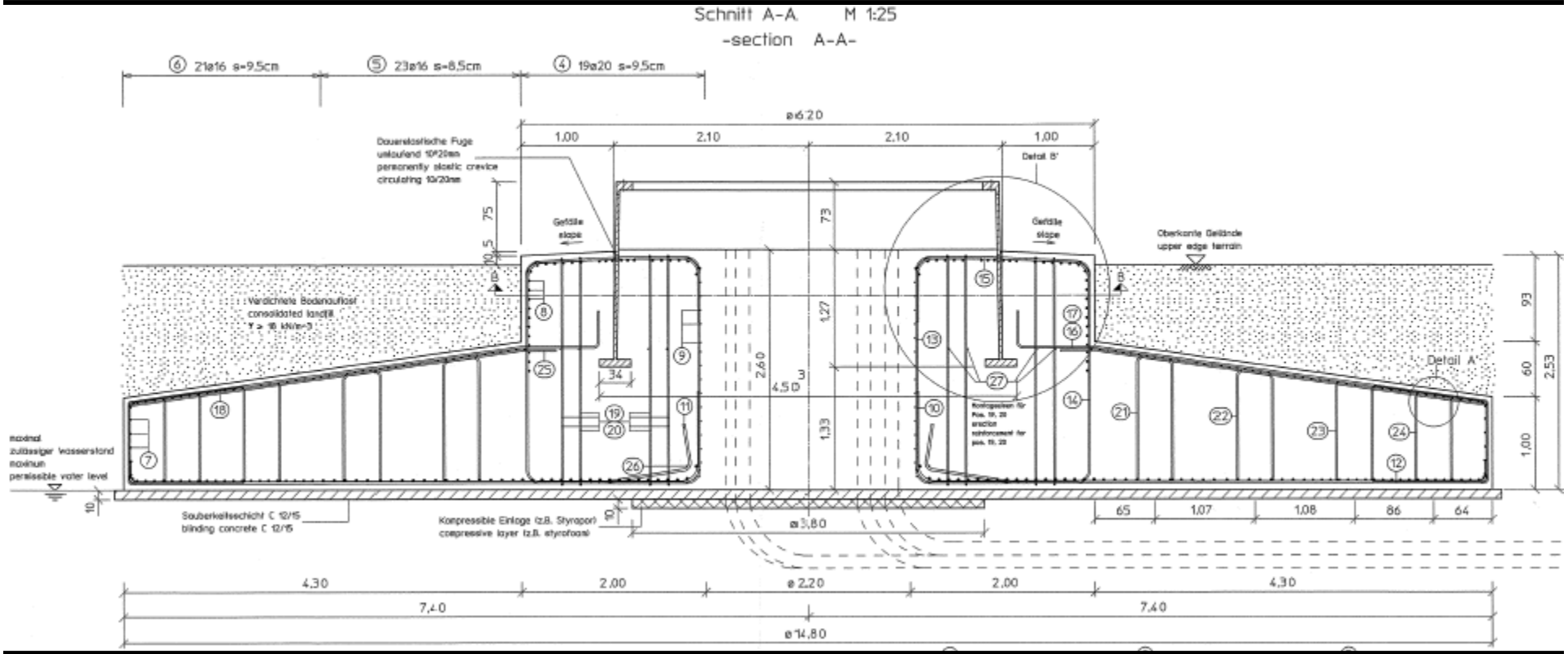

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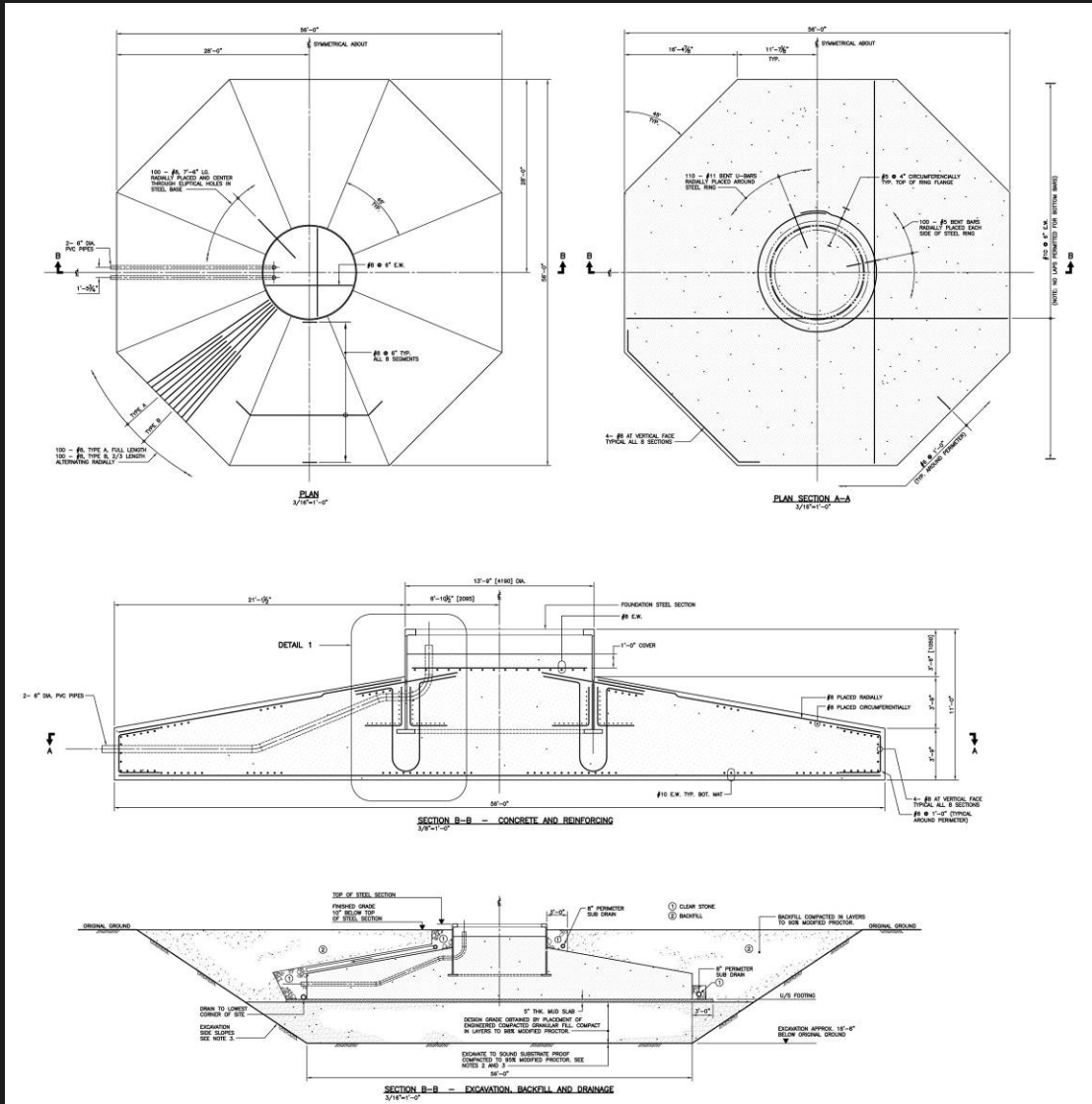


Technology – Turbine Components

Technology – Turbine Components

Technology – Latest Advancements

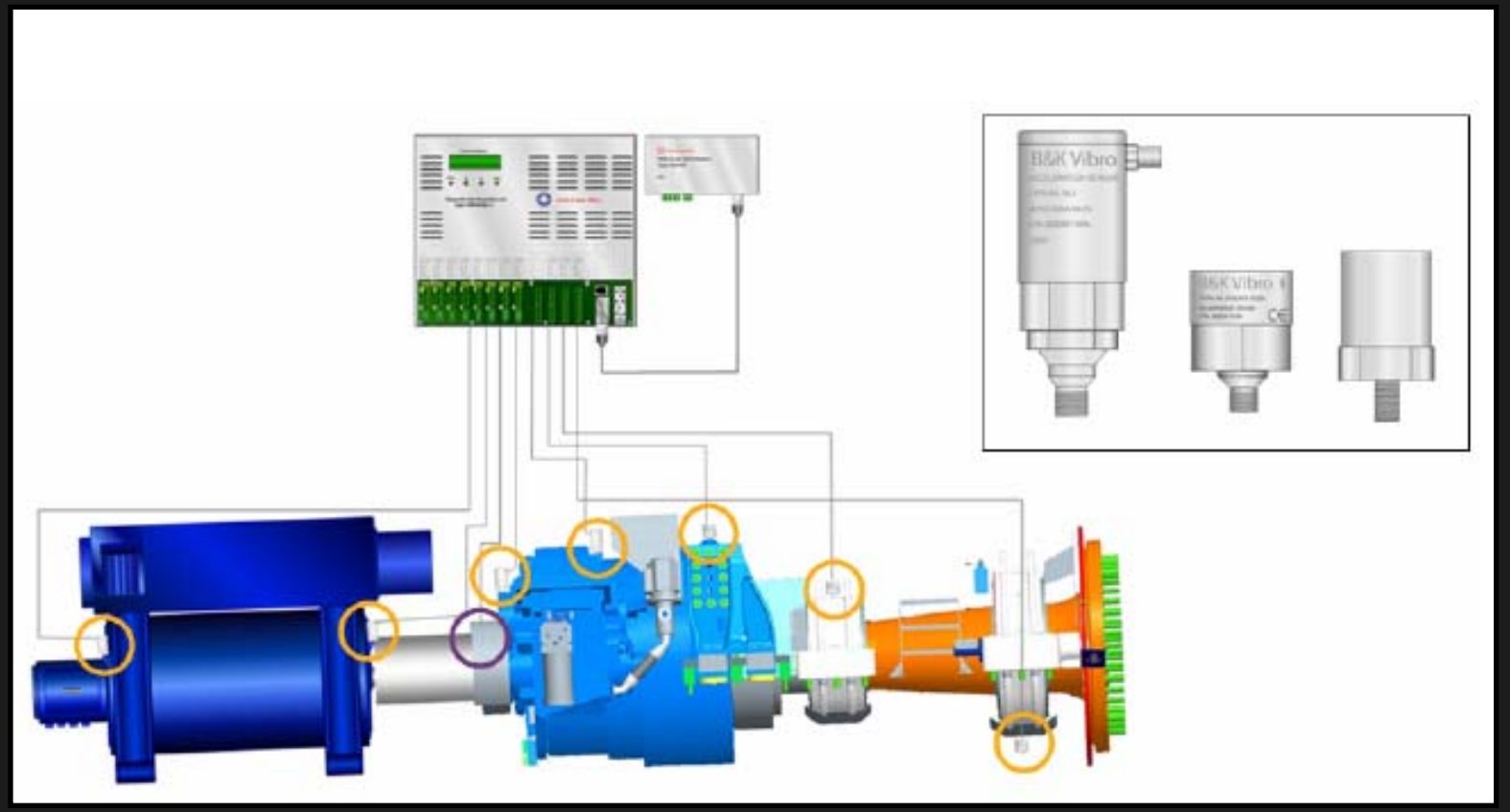
- Largest turbine yet: Enercon E-126 – 7MW
- Condition Monitoring
- LiDAR – vertical and horizontal
- Concrete towers

Enercon E-126

7MW

136m Hubheight

Typical Condition Monitoring



LiDAR Measurements

Concrete Tower

Wind Power - Industry Overview

The fastest growing power generation technology

Operating Wind Power Capacity per region

Region	2005	2006	2008
Europe	40,722 MW	48,122 MW	65,255 MW
1. USA	9,149 MW	11,603 MW	25,170 MW
2. Germany	18,428 MW	20,622 MW	23,903 MW
3. China	1,266 MW	2,599 MW	12,210 MW
4. Spain	10,028 MW	11,630 MW	16,740 MW
5. India	4,430 MW	6,270 MW	9,587 MW
11. Canada	683 MW	1,460 MW	2,369 MW
Total:	59,024 MW	74,151 MW	121,188 MW

World Wind Energy Report 2008 – World Wind Energy Association – Feb,2009

Pro's and Con's of wind power

PRO's

- Clean
- Predictable Costs
- Beautiful

CON's

- Non-dispatchable
- Transmission system expansion needed
- "Visual Pollution"

Current Issues and Challenges

Health and Environment issues

- Noise / Infrasound
- Bird and Bat impact
- Visual impact

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June 1, 2009

His Worship Mayor Randy Hope and Councillors
The Municipality of Chatham-Kent
315 King Street West
Chatham, ON N7M 5K8

Dear Mayor and Councillors:

RE: REQUEST FOR FURTHER CLARIFICATION ON HEALTH EFFECTS OF WIND TURBINES

I am aware that Council has received a great deal of conflicting information on this issue, including health complaints in our own Municipality alleged to be caused by proximity to wind turbines. I will explain the position of the Health Unit that there is currently no substantial basis to conclude that wind turbines are directly eroding the health of people.

Evidence for medical conclusions is categorized into three levels, with level I providing the strongest evidence and level III the weakest.

- Level I: Evidence obtained from at least one properly designed randomized controlled trial.
- Level II-1: Evidence obtained from well-designed controlled trials without randomization.
- Level II-2: Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than one center or research group.
- Level II-3: Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled trials might also be regarded as this type of evidence.
- Level III: Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

Unfortunately, statistical analysis is limited with regard to wind turbine effects because of the paucity of level I and II evidence. Most of the so-called studies purporting to document adverse health effects caused by wind turbines are self-reported accounts or

open surveys of health issues that are nonspecific and common irrespective of wind turbine exposure, such as insomnia, hypertension, anxiety, digestive disturbances and subjective sensory changes. These accounts have been reported by the media and have created an impression in the public before a rigorous analysis has confirmed that there is either excess morbidity or an association with wind turbines. Uncontrolled selfreporting eliminates any chance of scientific analysis as there is no motivation or reason to report a lack of symptoms or a way to include all people in proximity to turbines. There is no mechanism to exclude people from participating in a self-reported survey multiple times. The boundaries of proximity are often not even defined. The lack of controls (a sample of people not exposed to wind turbines), failing to blind the surveyors (they should not know the exposure history before asking the questions) and not defining the study population result in what researchers call preselection bias. Similar surveys in the past have tended to distort and overestimate the prevalence of many things from “cancer clusters” to sexual practices (Kinsey’s infamous sex surveys). There is no local data on the prevalence of these symptoms before wind turbines were installed, so it cannot be determined whether or not there has been an increase. The most eloquent spokesman for the anti-wind turbine activists, former UWO Dean of Medicine Dr Robert McMurtry, has admitted that there are no controlled studies, and he has called on the province to conduct such a study. This has been supported by at least one Ontario Health Unit, but this would be methodologically difficult. It is not possible to design a study to conclusively prove a lack of association, such as that wind turbines cannot cause health effects or that there are no ghosts.

At the present time we have people who have concluded, with gut-felt certainty, that they have health problems caused by wind turbines. These reports have received a great deal of media attention and organized political action groups have been formed which advocate for government action to address these health problems and suspend the construction of wind farms. These objectors operate web sites and write letters which promulgate dubious explanations such as infrasound induced DNA alterations, “wind turbine syndrome”, coined by anti-wind turbine activist Dr Nina Pierpont ofMalone, New York for a complex of nonspecific symptoms and “vibro-acoustic disease ”,tissue fibrosis first ascribed to extreme sound and vibration exposure in aviation environments by Portuguese investigators Alves Pereira and Castelo Branco, but later associated with the much lower sound levels of wind turbines and even automobiles. No other researchers have confirmed these findings. Wind turbine syndrome and vibroacoustic disease impress lay persons as legitimate diseases which account for how they are feeling, but neither is listed in the International Classification of Diseases nor is described in any standard medical textbook. Most experts are skeptical that they exist.

...

In summary, there is no scientifically valid evidence that wind turbines are causing direct health effects, although the body of valid evidence is limited. It is unlikely that evidence of adverse health effects will emerge in the future because there is no biologically plausible mechanism known by which wind turbines could cause health effects. There are wind turbines in urban environments, including Toronto, that have not been causing problems. The European experience would indicate that wind farms can be compatible with rural environments. An annoyance factor undoubtedly exists to which there is individual variability. Associated stress from annoyance, exacerbated by all the negative publicity, is the likely cause for the purported erosion of health that some people living near rural wind turbines are reporting. Stress has multiple causes and is additive.

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Letters to the Chatham Daily News have castigated me for neglecting the health of Chatham-Kent citizens with the kind of inflammatory phrases spoken, it seems to me, in the language of people with a higher regard for their own convictions than for the facts.

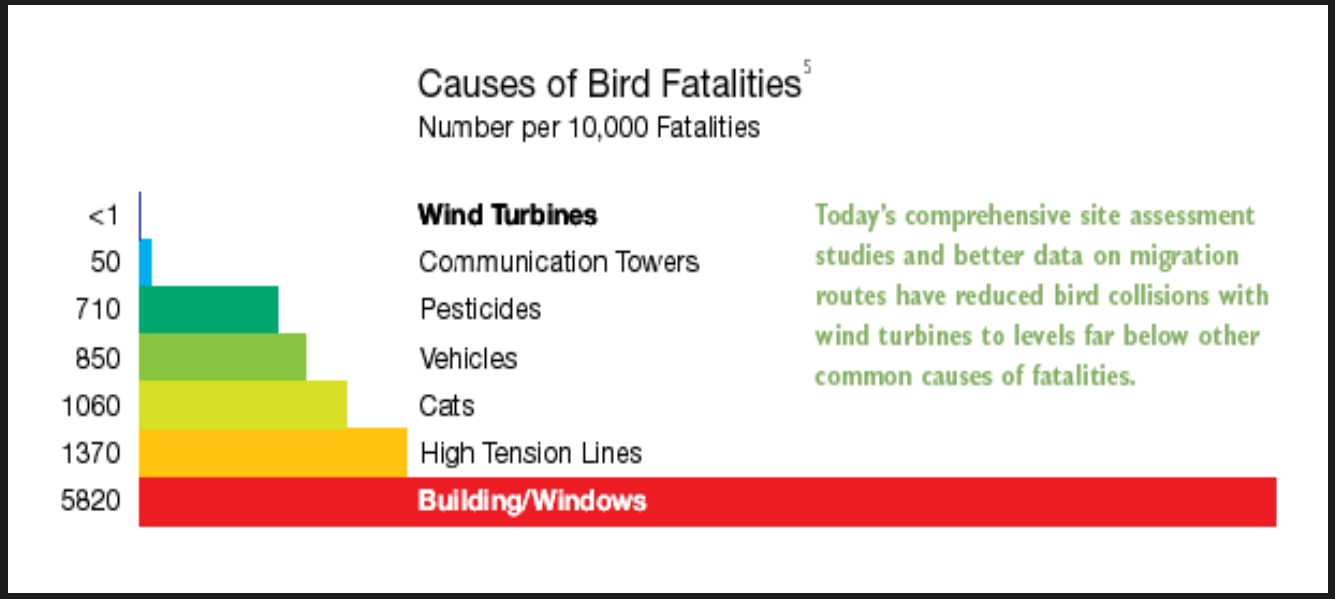
Sincerely,

W. David Colby, MSc, MD, FRCPC
Acting Medical Officer of Health
Chatham-Kent Health Unit

Current Issues and Challenges

Health and Environment issues

Bird and Bat impact



Bat impact is even more easily mitigated: Bats tend to fly only between August and October, only certain times of day and only if the wind is 6m/s or less. Shutting the turbines off at these times has a small impact on the economics of a project.

Current Issues and Challenges

Health and Environment issues

- Visual Impact:
  - All wind farms are modeled with realistic visualization techniques
  - Selecting the right color is key
  - While fears over property values persist, NREL research shows no decline in property values adjacent to wind farms – slightly faster value increase.
  - Wind turbines are pretty!

Current Issues and Challenges

Grid and Integration issues

- Transmission System Expansion
  - Biggest damper on growth
- Power Quality
  - Issues of concern are now routinely met by suppliers
  - New turbine modes offer superior features
- Wind Power Penetration and Curtailment
  - As amount of wind power on the grid increases, curtailment and ramp-rate limiting is becoming more common

Current Issues and Challenges

Economic and Political issues

- Turbine market boom and bust
  - New models new challenges to pick one
  - Shift towards Class III sites – bigger machines
- Subsidies
  - Ontario $135, Alberta (open market) ~ $50
- Siting close to populated areas
  - Case in point: Gabriola Island, BC
  - As lower wind speed makes $$ sense and good land runs out, wind farms will continue to move closer to homes.

Conclusion

Looking Ahead: Alberta, Canada and beyond

- Wind power penetration will continue to push the limits
- Alberta will need to expand its transmission infrastructure
- Canada will benefit from its large hydro storage capacity, especially in Quebec, Ontario and Manitoba.
- Heavy subsidies in Ontario will continue to fuel development and public discontent.
- Electric car industry will provide extra capacity to the grid and increase demand for wind energy.
- Ever larger turbines, ever larger projects.
- Shift towards class III wind sites

Thank You

Questions and Comments

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