

**RAQ Jan. 2010: Wind Energy – The Pros and Cons**  
*Wind Energy or Health?*

First of all, a disclaimer. I live on Amherst Island and Amherst Island is under threat of an industrial-scale wind development. On the other hand, I have no intention of harming a reputation for integrity. I believe that this is recognized by local and provincial politicians, developers and their consultants.

I will give a background on wind energy, its application in Ontario and then discuss the health problem.

Probably, we all see the need for renewable energy. Fossil fuels generate carbon dioxide and a variety of pollutants. The scientific models for global warming, sea-level rise and catastrophic weather events due to fossil fuel use are uncertain. Nevertheless, the smoking gun for most of us is the decrease in the Arctic summer sea ice coverage and the receding glaciers.

There are various schemes to combat global warming using invasive techniques in the atmosphere or the oceans. However, these are unproven and likely to cause harm.

The possibilities for CO<sub>2</sub>-free energy include carbon capture and storage, nuclear energy, wind energy and solar energy. Consider the costs:

<b>Energy Source</b>	<b>Cost</b>	<b>CO<sub>2</sub> Cost</b>
Coal	Cheap	High
Natural Gas	Cheap	Moderate
Hydroelectricity	Cheap	Low
Nuclear (in place)	Cheap	Low
Nuclear (new)	Moderate	Low
Carbon Capture	Probably moderate	Low
Wind	Moderate	Low, needs back-up
Solar	High	Low, needs back-up

Consider the availability of solar and wind energy: The average electric power consumption of Ontario is about 20 GW. The world-wide energy consumption is 1000 times this. The power available for solar collection is 5000 x the present world consumption. If the collection efficiency were 5%, then solar energy collection would need less than 1% of the earth's surface. A very well argued published report by Derek Abbott at the University of Adelaide concludes that down the road the only possibility for energy supply is solar collectors to produce electricity via steam generation and the storage and distribution of energy using hydrogen.

About 1% of the available solar energy is converted to wind energy. For northern parts of the world, wind energy makes more sense than solar energy. To satisfy world-wide energy demand, 40 million turbines would be required and would require land area at least equal to the area of Canada, the second largest country in the world. Wind energy is intermittent. So far, there is no storage system for wind energy and so wind energy will only ever be a supplement.

No countries have yet set the goal of 100% renewable energy. A common target is 20% of electrical energy. A few examples are shown in the table.

<b>Country</b>	<b>Wind</b>	<b>Solar</b>	<b>Total Renewable</b>
Spain	10%	<1%	19%
Germany	6.3%	<1%	13%
Denmark	9.7% + 8.3%		19%
Ontario	1.5%		28%

For Denmark, there are major grid links to Norway and Sweden. On average 19% of Denmark's electrical energy is supplied by wind. However, half of that is produced when not needed and is exported. When power is needed it imports hydroelectric power.

In another form:

<b>Country</b>	<b>Wind Capacity (GW)</b>	<b>kW per Person</b>
Denmark	3.2	0.2
Spain	15	0.1
Germany	24	0.05
USA	25	0.03
Ontario	1.1	0.025

Note that in Ontario, the demand for electricity is about 1.5 kW per person.

I will turn to Ontario. As many of you know, Canada was awarded the “fossil of the year” award at the Copenhagen Conference on Climate Change. A look at the next table shows that it was ill-deserved. While I was composing this talk I looked at the make-up of the Ontario electrical generation for one recent winter day.

**Ontario Electrical Power Generation – Dec. 30<sup>th</sup>, 2009 at noon**

<b>Source</b>	<b>Capability (GW)</b>	<b>Production (GW)</b>
Nuclear	10.5	10.0
Coal	4.9	2.0
Natural Gas	5.6	1.5
Hydroelectric	7.4	4.9
Wind	1.1	0.4
Other	1.7	0.1
<b>Total</b>	<b>31.2</b>	<b>18.9</b>

These numbers are fairly typical. Of the 18.9 GW produced about 10% will have been exported. Note that the fossil fuel contribution was less than 20%. The European protesters who made the award can only dream of such a fraction in their own countries. Quebec and Manitoba would be very similar. Where Canada suffers is in the heavy energy use by primary industry, heating costs and long-distance road and air transport.

Consider next the nascent wind energy generation in Ontario. Driven by the desire to close the coal plants, the government has vowed to increase both wind and solar energy. Its plans for new nuclear energy are on the back burner. With the decrease in mining, forestry and manufacturing in Ontario, the need for more power generation is not a priority.

Until the passing of the Green Energy Act last April, new wind energy development was a competitive endeavour and subject to provincial and local government approval. Typically, successful developers were bidding about 9 cents per kWh and were receiving 20 year contracts to accept every kWh produced whether wanted or not. This was the case for the Wolfe Island project. With the Green Energy Act, local approval has disappeared and the Feed-in-Tariff pays 13.5 cents per kWh. An environmental review is still a condition for approval.

As an aside, a price of 13.5 cents per kWh sets the carbon price of coal-generated electricity in Ontario to be \$80 per tonne of CO<sub>2</sub>. This is 4x the current price under the European Emissions Trading Scheme. Even more alarming is that the Ontario Feed-In Tariff for solar energy, 40 cents per kWh, sets the carbon price for coal-generated electricity to be almost \$300 per tonne.

**What is the problem with wind energy?** Obviously, the cost is going to have a long term impact on electricity prices and the consequent future for heavy industry. Also, wind energy is intermittent. For many parts of the world, these are the only problems. In the mountain regions of Europe and North America and throughout the Great Plains there is plenty of wind and it is not necessary to overlap with where people live. In Ontario, the wind drops on going away from the Great Lakes and so developers want to stay close to the water. But, that is where people live!

The main objections to building where people live and play are:

- 1) Aesthetics
- 2) Impact on Wildlife
- 3) Shadow and Flicker
- 4) Noise
- 5) Electrical Problems

In general, it is hard to argue on aesthetic grounds because beauty is in the eye of the beholder. The UK seems to be almost alone in keeping wind turbines away from regions of scenic interest. In Ontario where much of our scenic interest is water, the setback from waterfront and wetlands is 120 metres.

Wolfe Island is surely evidence that the integrity of migratory pathways is of no interest to the developers or the provincial government.

Where the developers are on the defensive is the health impacts of turbine noise. The Canadian Wind Energy Association claim that these 125 metre tall structures generating 2+ MW at full power are whisper quiet at a distance of 250 metres. This is just not true. Several years ago, health complaints were coming to light, first in the UK and the Netherlands and now in North America. The wind industry shrugs these off as anecdotal reports and not supported by epidemiological studies. Conversely, neither the wind industry nor the various governments have shown any initiative in starting a study.

Over the past year, a group in Ontario has been systematically collecting information on victims of wind-turbine induced health problems. One of the leaders of this group is a distinguished Ontario doctor, Bob McMurtry, former Dean of Medicine at Western and former assistant Deputy Minister of Health in Ottawa. So far, more than 100 victims have come forward. This takes some courage and tenacity because the only way out for these people is to move out of their houses and it doesn't help to sell a house when the reason is that the house is uninhabitable.

An extract of the accounts of 3 victims is given:

**1) Barbara and Dennis Lormand (Shelburne)** The noise changes from a loud whoosh - whoosh cyclic noise to sounding like a jet engine going overhead that never passes and some nights like a huge outdoor washing machine. Our health concerns are increasing over time. My husband is suffering from tinnitus on a constant basis. We are both suffering severe sleep deprivation and loss of energy and of cognitive function. The couple abandoned their home.

For this person, the wind developer eventually arranged for a noise audit. The noise consultant toned down the significance of the sound measurements but as soon as I got my hands on the data it was dynamite. The noise was in fact so far in excess of the noise regulations that MOE had to do something. The developer bought the house with the condition that the couple sign a gag order. To date, the developer has bought out 6 families at the same wind development, all with gag orders.

**2) Niki Horton (Chatham-Kent)** My husband has experienced sleep problems for several months now. He now sleeps with a loud radio and that helps a bit. I cannot sleep with a radio on and so we now sleep in different

rooms. I at times wake up feeling dizzy; when I close my eyes, I feel as if I am spinning. I feel my body falling into synch with the woosh-woosh noise. We have had to move items from shelves because the vibration moves them to the edge and over. I am most worried about my son Wyatt who has demonstrated some concerning symptoms.

Can you imagine raising children in a house when you know from your own health that they are going to suffer.

**3) The Wirtz Family** (Wisconsin) The Wirtz family raise alpaca. From the first day, the animals were panicky. Since the turbines started up there has not been one live birth.

The family also developed its own health problems. They just walked away from their farm and business.

This agrees with other evidence of strange animal behaviour: cats not entering the house or barn; barn cats disappearing, raptors on Wolfe Island moving to Simcoe Island; reports of deer in Germany moving away from the sites of wind development; dogs starting to pee on the floor.

There are many such reports of health impacts on people.

What is the problem?

Various health authorities who have noted these complaints recommend setbacks from homes of about 1.5 km.

Setbacks world-wide are based upon noise regulations for wind turbines and an accepted protocol for calculating noise at a home due to nearby turbines. The regulations are generally based upon those already developed for roads and industrial plants. This is a general audience and so I am not going to get into technical details. However, by using these regulations, wind developers come up with setbacks of 450 metres from single turbines and 600 metres from multiple turbines.

There is a clear disconnect. To some extent this is caused by leniency on the part of governments which want to see renewable energy developed without doing it themselves. But, that is not the whole story. There have been field studies, one in Sweden and one in Wisconsin, which studied annoyance.

The findings were that about 50% of people are annoyed by turbine noise at the Ontario regulation limit (40 dBA) compared to 3 – 4% for road noise at the same level.

Turbine noise has some characteristics that lend themselves to this problem:

For obvious reasons, turbines are located in rural areas. These rural areas are very quiet, particularly at night. Therefore the Ontario limit allows much more intrusion than is the case for industrial plants in urban or semi-urban areas. The noise limit in Germany is significantly lower than in Ontario.

Turbines generate a swoosh-swoosh sound because the noise increases as the blade passes the tower. This periodic sound is not only annoying over a period of time but is averaged away because the regulation demands a 10 minute average sound. It is a fact that some industrial plants also generate periodic or impulsive sound. Ontario allows for this by adding a penalty for such sounds. Arbitrarily and under pressure from the developers it removed that allowance for wind turbines.

Alone in the world, Ontario allows turbine noise to increase with wind speed. The rationale is that the wind will create noise in ground level vegetation which will mask the turbine noise. This is known to be a fallacy at night-time because the atmosphere becomes stable with low wind speed at ground level and higher wind speed at the height of the turbine hub.

Any scientist or engineer knows that a measurement and a calculation based upon measurements are subject to uncertainty. The manufacturers of turbines know this and the designers of the prediction codes know this. However, the developers ignore the uncertainty in the specifications and the prediction calculations and the Ministry of the Environment allows them to do so.

Many victims report a similar disturbing rumbling character of turbine noise – the washing machine, passing train that does not pass, the jet engine. I believe that the cause is the passage of the blades in turbulent air. No jurisdiction considers this in their regulations. Much is known about the influence of turbulence. After all turbulence is a potential cause of blade failure and, for clusters of turbines, the wake turbulence takes away from the efficiency of downwind turbines. It is known that blades turning in turbulent

air generate significant low frequency noise and this could account for the reports of the rumbling. This is what I am working on at present.



I would like to summarize what these considerations would do to setbacks,

		Setback (metres)
Present Regulations (GEA)	(40 dBA)	550
With Reduced Limit	(35 dBA)	650
With Penalty for Cyclic Modulation	(+5 dBA)	900
With Uncertainty	(+4 dBA)	1250
Penalty for Turbulence	?	?
Goal of Medical Authorities		1500

These modifications are all perfectly reasonable and defensible. The 35 dBA limit is used by Germany and we know that the German experience has been a model for Ontario. Anyone who has stood a few hundred metres from a turbine knows that the noise is cyclic; a penalty makes sense.



Nothing should be built without regards to uncertainty. There needs to be research on the effect of turbulence in the atmosphere. Together these changes would bring regulations into line with the recommendations of health experts who have dealt with people with turbine noise problems. 1500 metre setbacks would not mean the end of wind energy. It would perhaps mean lower efficiency. European countries cope with lower efficiencies. Before the Green Energy Act, companies were falling over themselves to compete at 9 cents per kWh. At 13.5 cents per kWh, developers can still profit with efficiencies of 20%.

The bottom line is that, even in Ontario which is not particularly favourable for wind energy, it is possible for wind energy and health to co-exist.