

# WIND POWER *Realities*

FACT SHEET

PUTTING WIND POWER MYTHS INTO PERSPECTIVE

## Getting the Facts Straight

Harnessing the power of the wind has become one of the fastest growing sources of global electricity generation. As countries strive to develop clean and secure energy systems, more scientists, policy makers and communities are looking to wind power as an important part of the solution.

As new opportunities emerge to develop wind-power generation in communities across Canada, they raise reasonable questions about the social, environmental and economic impacts of large-scale wind power production.

This fact sheet aims to help answer those questions, and to distill the realities of wind power from the myths and misconceptions.

### Canada's options

Currently, electricity produces 17% of all greenhouse gas pollution in Canada — that's more than what is produced by the oil sands or by all of the cars on Canadian roads.

In addition, many of our older power plants, particularly nuclear and coal, are nearing the end of their lives. That presents a challenge — and an opportunity.

Canada has the potential to generate at least 20% of its power from the wind by 2025.

Canada currently generates its power from the following sources:

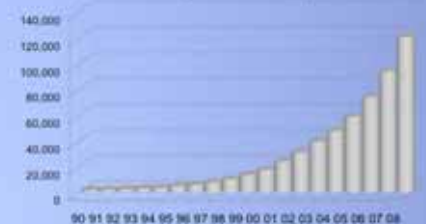
- 60% hydro
- 15% coal
- 13% nuclear
- 9% natural gas
- 3% other sources
- 1% wind power

(Source: National Energy Board 2008)

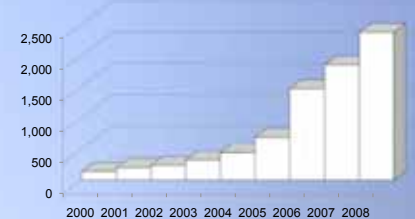
Increasing the supply of energy from clean, renewable sources like the wind will create new jobs and decrease our dependence on non-renewable and high-polluting energy sources. This will become even more important as consumers put more demand on the power grid in the future through the use of new technologies such as the electric car.

*Denmark is a world leader in integrating wind power. Every year since 2000, the country has produced enough electricity from the wind to supply close to 20% of its national demand.*

Global Wind Capacity  
(Cumulative MegaWatts Installed)



Canadian Wind Capacity  
(Cumulative MegaWatts Installed)



▲ Wind power installations have grown by rates of 20–30% both globally and in Canada. (Source: Global Wind Energy Council)

"A green, renewable energy economy isn't some pie-in-the sky, far-off future — it is now. It is creating jobs — now. And it can create millions of additional jobs, an entire new industry, if we act now."



Photo: The White House

— U.S. President Barack Obama

## Benefits of developing wind power:

- 1 Creating jobs in project development, construction, maintenance and manufacturing.
- 2 Stabilizing long-term electricity costs as the fuel source (the wind) is not depleted and does not increase in price.
- 3 Creating healthier living conditions by reducing air emissions including carbon dioxide, mercury, sulfur and nitrogen oxides.
- 4 Not leaving future generations with the risk and responsibility of managing wastes.



Photo: Tim Weis, The Pembina Institute

▲ The United States is the world's largest market for wind power, employing more than 85,000 people. (Source: AWEA)

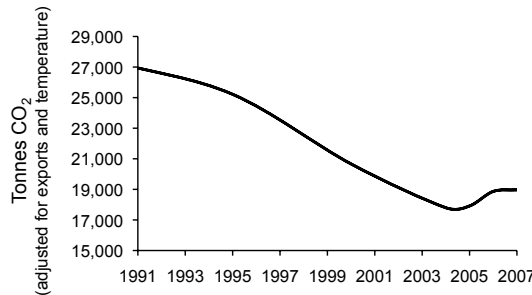
# Reducing carbon pollution

Generating electricity with a wind turbine emits no greenhouse gasses, and every unit of electricity produced can be used to replace power from fossil fuel plants. Denmark increased its reliance on wind power from 3% of its total electricity supply up to 19.7% between 1991 and 2007. That, along with other measures, reduced emissions from electricity production by 30% over the same period, while the country's GDP grew by 45%.

It does take energy to build a wind turbine, but life-cycle studies done by Risø laboratories in Denmark found that this energy is quickly recovered

once the turbine is functioning. It takes about 100 MWh of energy to build a typical wind turbine that will generate between 7,500 MWh to 9,000 MWh in its lifetime, so the electricity required for manufacturing is recovered within roughly three months.

Emissions Resulting from Danish Electricity Production



(Source: Danish Energy Agency)

# Ecological considerations

Compared to coal, oil, natural gas, nuclear and hydro, wind power generation has the least impact on wildlife, according to research commissioned by New York State Energy Research and Development. Wind farms must undergo environmental assessments on a case-by-case basis to minimize any potential harm.

*"Audubon strongly supports properly-sited wind power as a clean alternative energy source that reduces the threat of global warming."*

— American Audubon Society

Some local populations of birds and bats may be negatively affected by wind development. At the few sites where bat populations have been adversely affected, preliminary research suggests that bat fatalities have been reduced by more than 50% by shutting down the turbines for a few hours a week at certain wind speeds and at times of night when bats are particularly

active. Research has also shown that, on average, a typical turbine in North America kills just two birds each year. In contrast, around 10,000 birds die each year from colliding with office towers in Toronto.

Causes of Human Related Bird Fatalities  
Number per 10,000 Fatalities



(Source: A Summary and Comparison of Bird Mortality from Anthropogenic Cases with an Emphasis on Collisions; Erickson, et al.)

# Economic considerations

The communities surrounding wind power projects can benefit from new jobs, increases in municipal tax revenues, landowner lease payments on the order of several thousand dollars per turbine, and potential spin-offs such as tourism. In Pincher Creek, Alberta, for instance, wind farms generate more than a quarter of the municipal district's annual revenue, and have become a significant employer in the region.

As the industry has grown in the last decade, the costs of wind power have decreased steadily. Onshore wind power typically costs 8–12 ¢/kWh, depending largely on how windy the site is and how far it is from existing power transmission lines. This cost is already competitive with many other power sources, and once turbines are installed, the cost of generating wind power will remain steady for decades. By contrast, electricity prices have risen steadily across Canada over time. Regulations to make polluters pay for their emissions will mean that the cost of power from fossil fuels will continue to rise, on top of normal market fluctuations.



Photo: David Dodge, The Pembina Institute

Germany has integrated almost 15% of its power from renewable energy sources at a cost of less than \$4/month per household. And while Germans pay more per kWh of electricity than Canadians, by using energy more efficiently, a typical German household pays less per month than its Canadian counterpart.

## Producing reliable power

At low levels, the natural variations in the wind are dwarfed by the normal fluctuations in the electrical system that are caused, for instance, when consumers turn appliances on or off. Variations in the output from wind turbines can be predicted and balanced by grid operators using complementary energy sources.

Some remote communities in Australia and Alaska can supply up to 100% of their electricity from the wind. Adding more than 5–10% of power to a provincial grid usually requires new transmission networks and long-term planning. But a recent General Electric study for the Ontario Power Authority found that Ontario — Canada's leader in wind energy — could increase its wind capacity over 10 times its 2006 levels without major infrastructure upgrades.

*"We said that the electricity system could not function if wind power increased above 500 MW. Now [2003] we are handling almost five times as much. And I would like to tell the government that we are ready to handle even more..."*

— Western Danish system operator ELTRA



Photo: Tim Weis, The Pembina Institute

After examining 25,000 properties within 8 km of wind farms, the Renewable Energy Policy Project found "...no evidence that property values decreased as a result of wind farms." In fact, for the great majority of projects, property values actually rose more quickly for properties within sight of the wind farm than in the rest of the community. Values of properties within sight of the wind farm also increased faster once the projects came online than they had before. (Sterzinger, et al. 2004)

In an average year, a single wind turbine (1.8 MW) will produce 6,000 MWh of electricity, or enough power for more than 750 Canadian homes. Using this wind turbine rather than burning coal to produce electricity will leave 2,700 tonnes of coal in the ground and reduce greenhouse gas emissions by 6,000 tonnes annually. That's equivalent to taking 1,260 cars off the road or planting 30,000 trees.

Photo: (upper) Tim Weis, The Pembina Institute; (lower) Ontario Power Generation

# Health and noise considerations

Since the early 1980s, more than 68,000 turbines have been installed around the world, with more than 30,000 currently operating in North America. Before they are approved, wind projects must pass government regulated environmental assessments, limits on noise and minimum setbacks. Ontario's current setbacks are more stringent than those in eight European countries.

As a result of advances in technology, the sound levels emitted by modern wind turbines have steadily decreased, but they are not perfectly silent. The chart below compares sound from modern utility-scale turbines to other sounds people encounter every day.

For decades, thousands of people in Europe have lived and worked near wind turbines. A relatively small number of people have reported experiencing conditions such as headaches and difficulty sleeping, which has prompted numerous studies for peer-reviewed scientific journals and government regulatory bodies.

A 2006 study for the UK Trade and Industry Department found "there is no evidence of health effects arising from infrasound or low frequency noise generated by wind turbines," while the UK National Health Services found "no conclusive evidence that wind turbines have an effect on health."

*Using wind energy in place of non-renewable fuels, such as coal, reduces air pollution and other wastes known to have acute and chronic health impacts.*

In Canada, Chatham-Kent Public Health examined whether health problems could be attributed to wind turbines. It found that, as long as the Ministry of Environment Guidelines for location criteria are respected, the impacts of wind turbines on the health of local residents would be "negligible." The report concluded: "Although opposition to wind farms on aesthetic grounds is a legitimate point of view, opposition to wind farms on the basis of potential adverse health consequences is not justified by the evidence."

In October 2009, Ontario's Chief Medical Officer of Health issued a memorandum stating that, while some people may find the noise from wind turbines "annoying," a comprehensive scientific review found "no evidence of noise-induced health effects at levels emitted by wind turbines."



# The eye of the beholder

Wind turbines are dominating features on a landscape. Many people consider them graceful, but others find them intrusive. Surveys have found that support for wind farms increases the closer a community is to a project. Widespread consultation and engagement with communities, experts and other stakeholders remains the key to choosing appropriate locations for future wind projects.

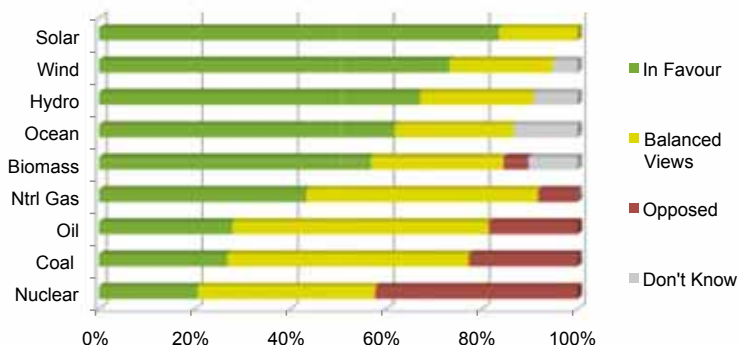


## More Information

Inform yourself! You'll find videos, slideshows, fact sheets, reports and summaries of the latest research on wind and other renewables at [re.pembina.org](http://re.pembina.org).

This fact sheet was prepared by Tim Weis, Director of Renewable Energy for the Pembina Institute.

Attitudes Toward Energy Sources in the EU



◀ Nowhere is wind power more prominent on the landscape or in closer proximity to people than in Europe, where polls show very strong public support.

(Source: European Commission, 2007)