Why we harness the wind.

From the ancient Egyptians to today's modern wind farms, the wind has always been a natural ally in propelling our societies forward. Today, instead of grinding grain and pumping water, we can harness the wind to generate electricity.

In Canada, there is more than enough wind potential to make a big contribution to our energy needs. Wind energy is an affordable and viable source of electricity, powering 315,000 Canadian homes in 2006. Using our untapped wind resources might one day see us provide for 20% of our electricity needs – enough to power 17 million homes.

6000 BC: wind powers the first sailboats along Egypt's Nile River

1600s: windmills pump water from Holland's reclaimed wetlands

1888: Charles Brush develops first large wind generator producing 12 kW DC

Early 1900s: Windmills drive pumps & generators across rural North America

1941: Putnam's 1.25 MW turbine demonstrates need for lighter materials

2006: 3 MW turbines in production and 5 MW prototypes are tested

Wind: a power unlike any other.

"According to the World Energy Council, during the last decade, global wind energy capacity has doubled every 3 years – about a 30% increase annually."

The history of wind.

No matter how far back we go in time, mankind has relied upon the wind. The ancient Egyptians used wind to sail the Nile, and the ancient Persians created the first windmills to grind grain and pump water.

The Dutch used windmills to reclaim their land from the sea by draining wetlands. Windmills were first used to generate electricity in North America in the 1800s and continued to do so up until the 1930s when the extension of the electric power grid to rural areas brought the decline of demand for electricity generated on-site. As we enter the 21st century, the continued evolution of wind turbine technology means wind energy is poised to power us into the future.

Canada's bountiful resource.

So how much wind do we have at our disposal? In Canada, we have more than we could ever use. Wind is abundant and free. Our vast landscape, our three windy coastlines, the plains and mountains all contribute to this endless resource.

Today, we are just beginning to tap into Canada's potential wind resource, which currently powers the equivalent of 315,000 Canadian homes. Tomorrow we hope to do even more. Like Denmark, Canada has more than enough wind resources to meet 20% of our electricity demands – enough to power 17 million homes! As long as the wind continues to blow, there is a great future in wind energy.

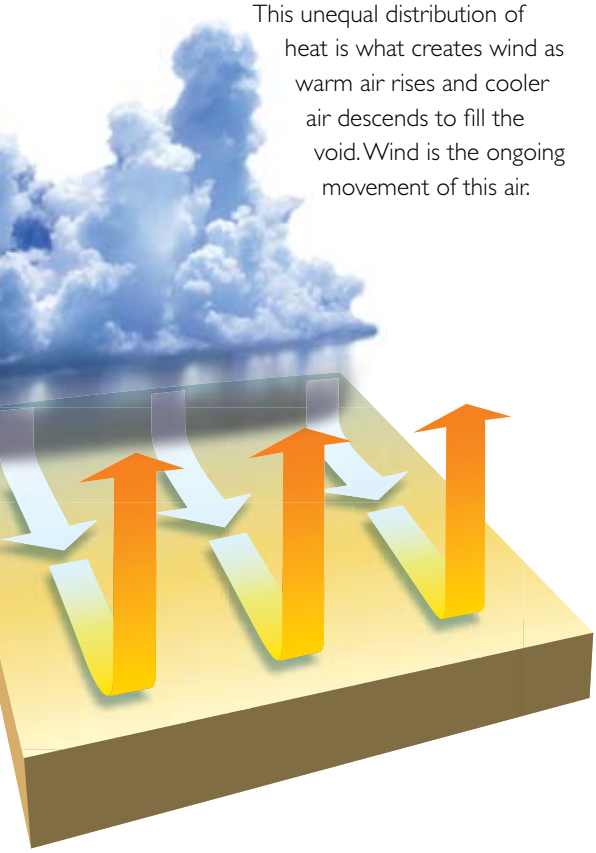
photo courtesy of Vision Quest

"Q. What are the advantages of setting wind turbines high in the air where the wind speed might be faster?
A. The higher the wind speed, the more energy generated. For instance, the doubling of wind speed generates eight times more power."[2]

The ultimate source of power.

Wind is powered by the sun. In fact, all renewable energy, and even energy in fossil fuels, ultimately comes from the sun. The sun heats our planet to different temperatures in different places and at different times.

This unequal distribution of heat is what creates wind as warm air rises and cooler air descends to fill the void. Wind is the ongoing movement of this air.



Capturing the wind.

The modern wind turbine was built to adapt to all kinds of wind and weather conditions. Turbines can even work on the water – think offshore wind farms. The way turbines work is simple, the blades spin and convert wind into electricity. Wind turbines sit high atop towers that may be a hundred meters high so that the blades of the turbine are free of obstacles and take advantage of higher and more constant wind speeds.

Mechanical power is created when the blades turn in the wind – power not unlike the windmills of old with their ability to mill grain. Instead, modern wind turbines use this mechanical power to turn a generator and produce electricity. Cables carry this electrical current to transmission lines that then carry it to homes and businesses.

Turbines are built to adapt to all kinds of wind conditions. Typically the blades begin to turn when the wind reaches 13 km/h and shut off when the wind is too strong – 90 km/h and above. The blades can rotate to face the wind to optimize wind coming from nearly any direction. Should they continually rotate in the same direction, turbines can "unwind" to prevent internal cables from becoming twisted.

As the sun warms the earth, it in turn, warms the air above it, making it less dense or lighter. As the light air rises, it creates a low pressure zone near the ground. Air from surrounding cooler areas rushes in to balance the pressure. These are called local winds.

Temperature differences between the polar caps and equator, as well as the rotation of the earth, produce similar results on a global scale, called prevailing winds.

RESOURCES

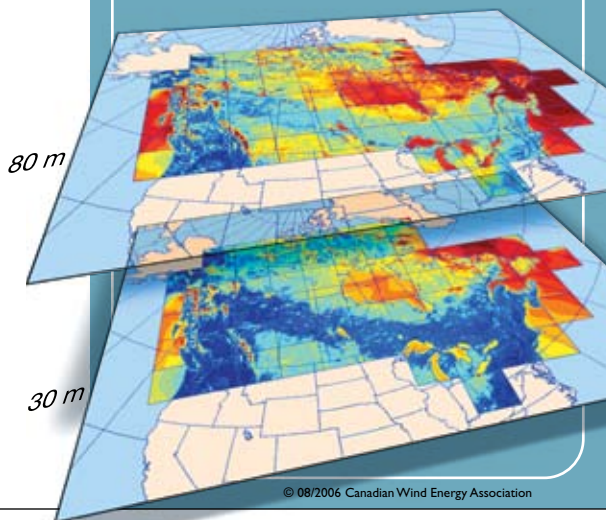
Environment Canada's Wind Energy Atlas

www.windatlas.ca

Wind accumulates energy as it crosses large, uninterrupted expanses called fetches. Oceans, large lakes and prairies are perfect fetches. With the longest coastline in the world (243,792 km or 151,485 miles) and some of the world's largest open prairies, we have one of the best wind resources on the planet.

Environment Canada's Wind Atlas provides valuable data for developing our wind energy industry. This website features colour maps that show the average wind velocity and power for the whole country.

As with fetches, mentioned above, wind speed also increases with altitude. This image shows the difference in wind speed between 30m and 80m above ground. Dark blue is slowest and dark red is fastest.



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1: To see Canada's bountiful wind supply, visit www.windatlas.ca
2: http://www.windpower.org/en/tour/wres/enrspeed.htm

Printed in Canada

Change is in the air.


photo courtesy of Vision Quest


photo courtesy of GE

Wind power keeps improving in big and small ways. Advances in technology and soaring global energy costs are making wind power a clean and viable option for big and small energy producers everywhere.

There's a growing interest in wind right across this country. From major power producers looking for cleaner ways to produce energy for the grid to inventive companies searching for alternative ways to power their plants – even down to the individual who wants to live off-grid – it's the people who believe in wind who power it.

"In early 2006, world wind capacity reached 59,322 MW. According to the World Energy Council, if the current growth rate continues, global capacity will reach 150,000 MW by 2010."[1]

Belief in wind is driving the advances.

Wind turbine technology.

The windmill has been used for millennia to grind grain. In the decades leading up to the 1930s, the wind turbine was used to generate electricity. Since the 1970s wind power, and the technology behind the modern turbine, has undergone a revolution.

The first modern turbines were larger than those of the 1930s and were grouped together to form wind farms for the purpose of generating electricity. First used in Denmark and California in the 1970s, the average output of a wind turbine back then was 100 kW. Today, that output is typically 20 times greater.

Today's turbines are far more efficient machines. They sit higher up in the air affording them access to better wind resources and fewer obstacles. The materials used to build the blades are stronger and lighter, so turbines can be built bigger and cover a greater area as they spin, generating far more electricity with every sweep.

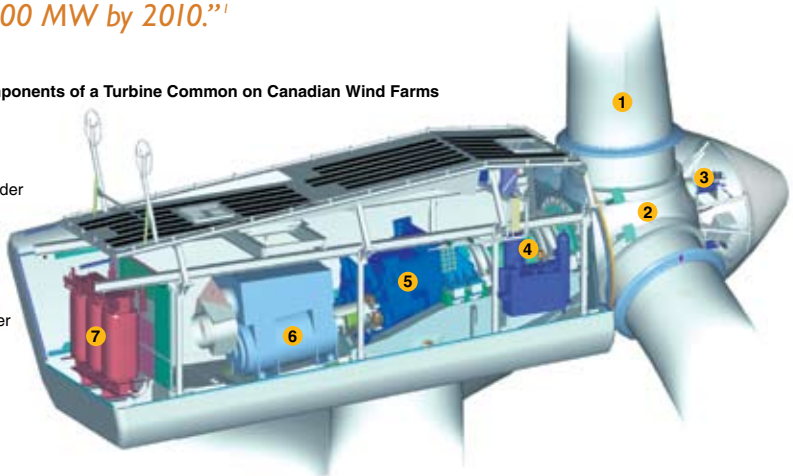
Offshore.

In other parts of Europe, a smaller inventory of onshore sites has led to the development of offshore wind. Putting turbines offshore offers producers the opportunity of a stronger and steadier wind resource. As offshore sites are more expensive to build, turbines must be larger and more efficient. Bigger wind turbines are being developed in Europe to make the most efficient use of their offshore wind resource.

In Canada, we are mainly focused on our onshore resource at this time, but some offshore projects are being pursued.

Primary Components of a Turbine Common on Canadian Wind Farms

1. Blade
2. Rotor Hub
3. Pitch Cylinder
4. Main Shaft
5. Gear Box*
6. Generator
7. Transformer



* Some turbine designs are "direct drive" and require no gear box.

illustration courtesy of Vestas Wind Systems A/S


photo courtesy of Vision Quest

PROFILE

How big are these turbines?

Big – and getting bigger all the time. Specs are for a 1.8 MW turbine.


photo courtesy of Vision Quest

The nacelle which the workers are standing on in the photo above, is the size of a small motor home and weighs 63,000 kg.

Each blade is 39 m long – the same length as a Boeing 737, and the 3-blade rotor weighs 35,000 kg.[3]

The 65 m tower is made up of rolled steel and comes in three pieces. The entire tower weighs 132,000 kg and contains enough steel to manufacture 206 average cars.[4]

The foundation is 9 – 10 m deep and 4 m across. 102 tension type bolts run the full depth of the foundation.

Swept area of the blades is 5,024 sq. m – the size of 3 NHL hockey rinks combined – or about 1.25 acres.

Total weight of the entire turbine is 230,000 kg – about the same as two fully fueled 3,200 HP diesel electric locomotives.

Even larger turbines are being tested for offshore applications. A 5 MW prototype with lightweight carbon fibre blades, 63 m long, covers a swept area two and a half times larger than the turbine described above. The 110 m tower is nearly twice as tall.[5]

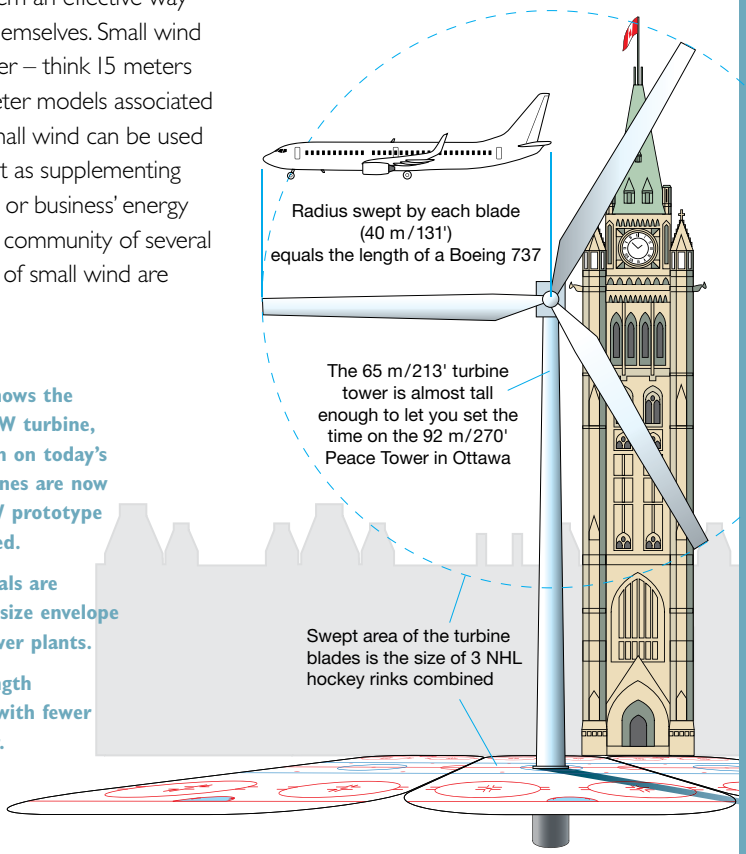

photo courtesy of Bergey Windpower Co.

Small wind. Small turbines.

Small wind turbines (300 kW or less and generally referred to as "small wind") give farmers or businesses a chance to generate electricity for their own purposes with one or two turbines located on their property. Small wind allows users to reduce their dependence on the grid and gives them an effective way to produce electricity themselves. Small wind turbines are much smaller – think 15 meters tall instead of the 90 meter models associated with wind farms. And small wind can be used for something as modest as supplementing a percentage of a home or business' energy use to powering a small community of several houses. The applications of small wind are limitless.[2]

Big advances. Bigger turbines.

Wind turbines and the farms that house them get bigger every year. The increased size of turbines has meant they can produce more energy more efficiently, and this drives down cost. In fact, the cost of wind-generated electricity has dropped more than 80% in the last 20 years and further declines are expected. Five years ago, wind turbines in Canada generated 600 kW, today the average turbine generates 1.5 MW. That's nearly a three-fold increase in output in just 5 years. Today 3 MW turbines are coming on line and in Europe, 5 MW prototypes are being designed – the technical evolution carries on.



This turbine diagram shows the relative scale of a 1.8 MW turbine, which is pretty common on today's wind farms. 3 MW turbines are now in production and 5 MW prototype turbines are being tested.

New lightweight materials are constantly pushing the size envelope for these sleek new power plants.

Increasing the blade length generates more power with fewer revolutions of the rotor.

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1: www.worldenergy.org/wec-geis/publications/reports/ser/wind/wind.asp
2: For some interesting applications of small wind, visit www.smallwindenergy.ca
3: Source: www.airliners.net/info/stats.main?id=96
4: Source: www.canadiansteel.ca/industry/factsheets/autoind.htm
5: Source: www.repower.de/index.php?id=237&L=1

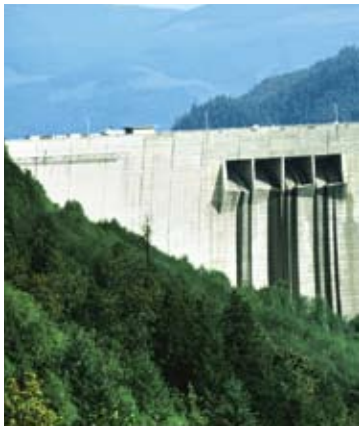
Wind power is here.

Wind power is determined by more than just how and when the wind blows. Wind energy is the culmination of years of studying the wind and perfecting the technology that harnesses it.

Wind is reliable and has the power to make a significant contribution to Canada's energy needs. In Denmark, 20% of electricity demand is currently met by wind energy. With our abundant resource, there's no reason why we couldn't follow their lead – and the Canadian wind energy industry is here to capture that potential.

photo courtesy of Vision Quest

"Wind has an availability factor of 98% – much higher than conventional forms of energy production."[1]



As long as there is wind, there will be wind power.

Changing winds.

Everyone knows that the wind is variable. Sometimes it blows, other times it doesn't. So how can wind power be a reliable source of energy? The answer to that lies in how we plan for variability.

Most turbines are located in sites where there's enough wind to produce electricity 70-80% of the time. Naturally, the amount of electricity produced varies with the wind. The way we manage for this variability is to locate wind farms in different geographical areas so that turbines can take advantage of different prevailing winds. The fact is, the wind will never stop blowing everywhere at once – even within a single wind farm, it's unlikely that all the turbines stop spinning at one time. With Canada's large and varied wind resource, there's no doubt that the wind can power us well into the future.

The power of two.

In Canada, we would never rely on wind turbines alone to meet the entire country's electricity needs. Instead, we use wind in conjunction with other forms of compatible energy production.

One example is wind and hydro-electric. These two sources of energy are a natural fit. In the winter, wind is at its peak, allowing hydro to store energy for use when wind productivity is lower. Hydro dams can be closed relatively quickly allowing water reserves to build when peak wind is in full swing.

In the spring and fall, hydro is at its peak production and wind energy serves as its supplement. It's interesting to note how wind energy can help us better manage our precious water resources.

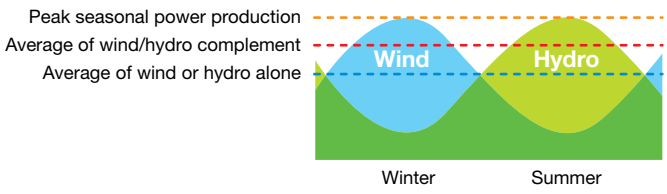


photo courtesy of Vision Quest

CASE STUDY

North Cape Wind Farm, PEI

Owner/operator:
PEI Energy Corporation

photo courtesy of PEI Energy Corporation

"The variability of wind matches the variability of demand. Generally wind is strongest in cold-weather months when our demand for electricity is highest." [2]

Capturing the energy of wind.

Estimating energy productivity is done through a calculation called capacity factor. If a power plant produced at full capacity 100% of the time, it would have a capacity factor of 100%. Of course, wind is variable, so it doesn't have a 100% capacity factor – but neither does any other form of energy. No energy source, conventional or otherwise, works 100% of the time. It's simply impossible.

There are periods when power plants shut down for maintenance and repairs. There are times when resources run low or when unexpected outages occur.

One of the greatest attributes of wind is that it blows hardest – and therefore generates more electricity – in the winter. Wind power offers an opportunity to add more green energy to the grid and to add it during the coldest months of the year, when demand is heavy.

Wind turbines are reliable.

Wind-generated power is a reliable source of electricity. Wind turbines have one of the highest availability factors – a term that refers to the reliability of the turbines and the percentage of time that a plant is ready to generate energy. Wind has an availability factor of 98% – much higher than conventional forms of energy production.

Maintenance issues are also much smaller on a wind farm. At some conventional power plants, the entire plant may have to be shut down for repairs whereas at a wind farm maintenance takes place one turbine at a time.

Enhanced technology and design improvements have also played a part in increasing the reliability of wind power allowing turbines to generate electricity in all but the most extreme weather conditions. Plus wind forecasting technology has the potential to make wind energy more predictable and more reliable than ever before.

On line since 2001, PEI Energy Corporation's North Cape Wind Farm – sited in one of Canada's windiest locations – has an installed capacity of 10.56 MW. With a capacity factor of 40%, it generates about 35,000 MWh annually – enough to supply 3% of PEI's electricity requirements, or about 5,000 PEI homes.

Together, with other wind farms, PEI will have 52 MW of installed wind capacity by mid 2007.

It's estimated that PEI could develop 200 MW of wind energy by 2015. PEI currently imports over 90% of its electricity from New Brunswick. By exporting excess wind energy during periods when production exceeds demand, it's feasible that PEI could net out as an energy self-sufficient province.

Purchasing agreement: North Cape Wind Farm's power is sold to Maritime Electric Company Limited for distribution. Maritime Electric can sell the power through their Green Power Program, which allows customers to purchase it at a premium price. This green power premium is passed along to PEI Energy Corporation. If the electricity available under this program becomes fully subscribed, then additional wind powered generators may be installed on PEI.

Yes, it's true; the wind blows some of the places all of the time, and all of the places some of the time – but it can't blow everywhere at once.

Wind is variable, but with good site selection, wind farms have access to strong and steady winds.

As of June, 2006, Canada's installed capacity was 1,049 MW – enough to power about 315,000 Canadian homes.

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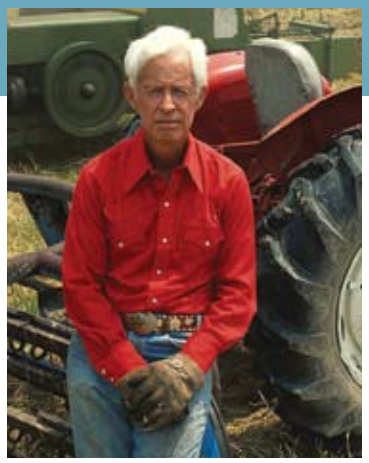
1: Source: http://www.awea.org/faq/tutorial/wwt_basics.html
2: Source: http://www.windpower.org/en/tour/grid/season.htm

Developing wind energy.

photo courtesy of Vision Quest

Planning a wind farm is a big task. It requires numerous municipal, provincial and federal approvals but the rewards make it worthwhile. Wind is a clean and renewable resource. It has no emissions and doesn't contribute to climate change.

Wind energy makes good economic sense and support for wind power in Canada is growing. From large energy companies to individuals looking to supplement their own energy needs – there's a great future in wind energy.[1]



Investing in nature's renewable resource.

Assessing wind as a resource.

There are a few key steps to take before a wind farm development can be approved. The first step is assessing the wind itself. Is there a strong and consistent wind? Scientists use wind resource assessments to evaluate the quality of wind on a given site for a period of at least one year. Wind speeds, direction, variability, and other factors all go into this careful stage of planning.

Environmental issues need to be taken into consideration right from the planning stage of the wind farm. For more information on this, please see our Wildlife Fact Sheet.

Accessing the land.

Like any other energy project, communities must be consulted and supportive of the wind farm before permits can be issued and the land can be developed.

A successful wind energy project is dependent on access to land on which there is a good wind resource. Energy companies may approach certain landowners and option their land. Once the project is approved land lease agreements are negotiated. A land lease specifies, among other things, the duration of time an energy company can use the land and the payments they will make to the landowner.

As with any other major power project, developers must seek municipal, provincial and federal permits before the project can go ahead. Land leases and contracts vary but typically pay a percentage of revenue in the thousands of dollars per year per turbine.

For more information on land leases, see our Community Benefits Fact Sheet.

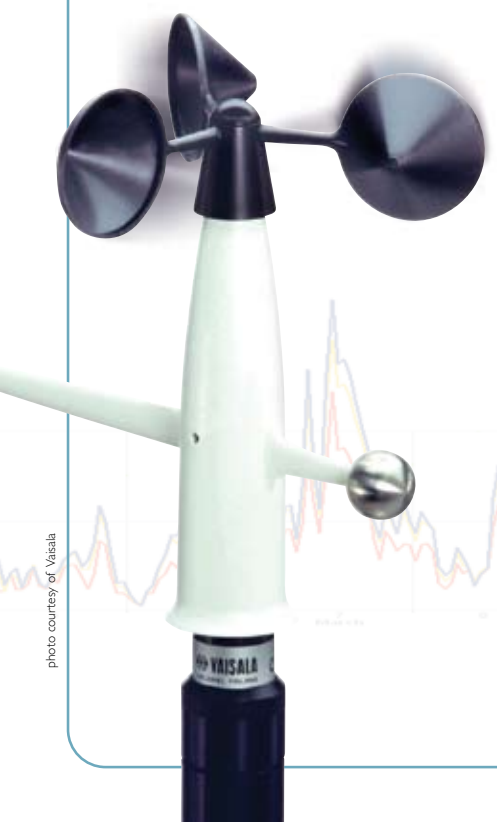


photo courtesy of Vaisala

In addition to collecting and analyzing wind resource data with instruments like the anemometer shown on the left, wind farm developers need to assess potential impacts to communications installations such as RADAR; microwave; wireless & cell networks

Connecting to the grid.

Another vital factor in determining the success of a proposal is proximity to the electricity grid. Many questions must be answered at the pre-planning stage: Does the energy carrier have space for the electricity? Will your site need upgrading? How will it connect to the grid and who will pay for that connection? The answers to these questions vary by province.

Finding buyers for wind power.

One of the most important factors to consider before developing a wind farm is who will buy the power. In many provinces, you must already have a buyer and a purchase agreement in place before permits are granted and turbines are installed. Other provinces don't have this requirement and electricity is bought and sold based on the daily market price.

Task Name	Start to Finish: a wind farm typically takes 12 to 36 months
Land Acquisition	
Option to Lease Negotiations	
Option to Lease Agreements Signed	
Options converted to Lease	
Resource Analysis	
Meteorological Tower Permitting	
Meteorological Tower Installation	
Resource Analysis	
Environmental Work	
Environmental Assessment	
Other Site Research	
Interconnection	
Interconnection Request	
Interconnection Studies	
Interconnection Agreement	
Permitting & Public Consultation	
Open Houses, Info Distribution	
Federal	
Provincial	
Municipal	
Secure Equipment	
Order Turbines & Major equipment	
Equipment Delivery	
Construction	
Foundations	
Electrical	
Tower Install	
Nacelle/Blade Installation	
Commissioning	
Commissioning Complete	

Factors such as terrain, size of the wind farm and regional approval process all impact the total time for planning and commissioning a wind energy project. Despite these variables, the table above shows the typical sequence and duration for each of the steps to get a wind farm up and running.

RESOURCES

Want to get involved in a wind energy project?

These sources are a good start…

Supporting wind energy is key to developing wind power projects here in Canada. Saying "yes" to wind is a great way to help us reduce the impact of greenhouse gases and move us into a cleaner future.

Support a local wind project

Contact your municipal government to see if a wind project is proposed in your community.

Build your own small wind project

Want to power your home, small business or community with wind energy? Visit our site: www.smallwindenergy.ca/en/SmallWind.html

Invest in wind energy: Help it grow and help us attain our goal of developing a clean, affordable alternative source of electricity. www.environmentalchoice.com/English/ECP Footer/About the Program/Criteria/Electricity Products/Renewable Electricity Investment Funds

Make your land available to a developer

Do you have a good wind resource on your property? Want to benefit from installing a wind farm on your land? Find the answers to all this and more in our Land Use Fact Sheet.

Buy green power: For a list of companies across Canada that sell green power visit: www.canwea.ca/en/GreenPower.html

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CanWEA acknowledges the contribution of Natural Resources Canada.

1: Source: http://www.earth-policy.org/Updates/Update24.htm

Wind is the way forward.

Wind energy is environmentally friendly and helps us make wiser choices with our precious natural resources. Compare wind to conventional forms of electricity generation like thermal power, which burns fossil fuels and contributes to climate change or to nuclear power, which uses vast quantities of fresh water and leaves behind toxic waste.

Wind power is a pollution-free and endless source of energy. It's clean and limitless and leaves a small environmental footprint on our planet. Wind is the natural choice.

According to Environment Canada, 18% of Canada's greenhouse gas emissions are created by burning fossil fuels to generate electricity.

Wind: a power unlike any other.

An environment with fewer emissions.

Electricity is a necessity of modern life. But modern life also means making wise choices. Wind energy is that choice. It helps diversify our energy mix and gives us a cleaner way to generate power for all Canadians.

Let's take a look at conventional ways to create the electricity used in our homes and workplaces. In many parts of Canada, much of this electricity comes from power plants that burn fossil fuels like coal or natural gas. An inevitable by-product of burning these fuels is air pollution.

When considering electricity generating options, we need to consider the full range of costs – including those associated with environmental impacts like air pollution and its long-term health effects.

With wind, there is a change in the air. Wind energy generates no air emissions at all. Turbines are powered by wind, naturally, and generate no air pollution. Wind energy doesn't contribute to smog, acid rain or climate change.

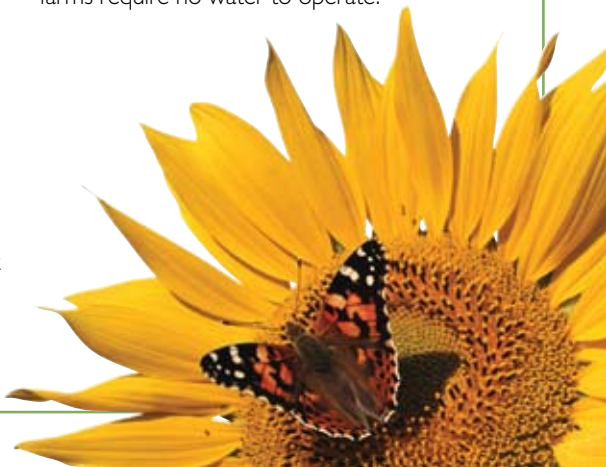
Adding wind to Canada's energy mix is a smart choice for the future – and the right one too.

Where there's wind energy there's less impact on water.

Fresh water is a precious natural resource we all want to preserve. Adding wind energy to Canada's energy mix is a great way to help us accomplish this goal.

Some hydroelectric power plants can disrupt existing water flows and flood vast areas of land. Nuclear and coal-fired power use over 500 times as much water, per unit of energy, as wind.[1] Thermal power production in Canada withdraws more fresh water than the manufacturing, municipal, agriculture, and mining sectors combined.[2]

Other than occasionally washing the blades in regions with extremely low rainfall, wind farms require no water to operate.[1]



The real cost of energy.

When we evaluate the cost of energy, we also like to consider the total environmental impact of getting energy from its initial source to you. This includes site construction, mining, transporting fuel, and the cost of closing down the power plant. Known as a lifecycle analysis, it helps us understand the real environmental and economic cost of energy.

Wind energy has very low lifecycle environmental costs – largely associated with producing and installing the turbines – and that's a good thing.

Conventional sources of energy have higher environmental lifecycle costs[1] because of all the activity it takes to turn these natural resources into electricity. For instance, coal and natural gas must first be extracted from the ground before being shipped by truck or train or sent by pipeline to power plants for conversion into electricity. All this uses energy and creates air pollution.

Whereas a wind turbine generates electricity whenever the wind blows with no need for extraction, transportation or any other environmentally damaging process. Just the pure movement of air is all it takes to power the turbines.

Recent Environment Canada statistics show air pollution causes an estimated 5,000 premature deaths in Canada per year and thousands more suffer from adverse health effects. Children and seniors suffer the greatest risk.

Nearly 12% of Canada's smog is a result of burning fossil fuels to produce electricity. The faster we bring more wind energy on line, the faster we can clear the air.

Footprints in the wind.

So what is the environmental impression wind energy leaves behind? Minimal. That's why the time is right for wind energy. Generating energy from wind doesn't contribute to climate change, leaves behind no hazardous or toxic wastes and uses no water.

This might explain why this low-impact[4], renewable, environmentally friendly source of "green power" is a rapidly growing component of Canada's energy mix.

That's why wind is the right choice right now.

According to the Renewable Energy Policy Project[3], a coal-fired power plant's lifecycle costs are over twice as high as a wind farm's, per unit of energy produced.

CASE STUDY

Ride the Wind!™

Vision Quest – TransAlta's wind business – and ENMAX Energy power Calgary's train system.

photo courtesy of Vision Quest

"Powered by wind-generated electricity, Calgary Transit operates the only emissions-free Light Rail Transit system in North America"
Ron Collins, Calgary Transit spokesman

In September 2001 the City of Calgary decided to power their C-Train with electricity from commercial wind energy and named it Ride the Wind!™ because riders would actually be traveling with the help of energy captured from the wind.

Before the switch, the C-Train's energy supply accounted for about 20,000 tonnes of greenhouse gases and other air pollution every year – still less than 1/10 of the pollution that would have resulted if all C-Train passengers had driven in their own cars. Most of that electricity came from coal-fired generating stations.

How it works: Each of the 12 turbines that power the C-Train, can produce more than 600 kW of electricity, or 1.3 million kWh of electricity annually – enough to supply nearly 250 average Alberta homes – and more than enough to meet the needs of C-Train commuters.

The results: Under the Ride the Wind!™ program, the C-Train's expected air emissions from electricity use have been reduced from 20,000 tonnes to practically zero. The resulting greenhouse gas reduction is like taking 4,000 cars off the road for a full year.

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1: Source: http://www.awea.org/faq/water.html

2: Environment Canada, National Water Research Institute

3: Renewable Energy Policy Project is available at: http://www.repp.org/articles/static/1/binaries/wind issue brief_FINAL.pdf

4: For the definition of low impact energy, see: http://www.environmentalchoice.com/English/ECP Footer/About Us/Criteria/Electricity Products/Electricity Generators

Birds, bats and wind energy.

Studies show that modern wind farms with sensitive siting have no significant adverse effect on bird populations. The wind energy industry is investing in closely monitoring this important issue and continues to work vigilantly to avoid any significant impact.

Wind energy is emission-free and can help offset the effects of climate change. Wind farms can also be developed with respect for habitats – addressing two significant threats to birds and all other forms of wildlife.

Making way for birds and bats.

How birds and wind turbines interrelate.

There are a few ways that wind turbines might interfere with birds – one is the potential impact to their natural habitat, another is through possible collisions with the turbines themselves. A well-sited wind farm goes a long way towards minimizing the risk to birds and brings about a natural and healthy co-existence between wind energy and avian creatures of all stripes.

A study reviewing the impact of wind farms on birds in the US, found that generally, only 2 birds per turbine per year ever die in collisions with wind turbines.[1]

Bear in mind that this is far less than the millions of deaths per year associated with birds crashing into buildings and windows, and the many millions of deaths associated with birds colliding with vehicles.

A real concern for birds is noted in the 2004 study in *Nature* that estimated that up to a quarter of all bird species could become extinct by 2054 due to global climate change, for which wind energy is one of the solutions.

"It is estimated that more than 10,000 migratory birds are killed in Toronto each year between the hours of 11:00 p.m. and 5:00 a.m. in collisions with brightly lit office towers."[3]

Climate change may result in devastating changes to breeding grounds as well as shorebird and waterfowl habitats. Migratory periods could shift out of sync with maximum food production times. These impacts are partly why Defenders of Wildlife believes that wind energy production should be expanded.[2]

1: see P. 22, Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Avian Collision Mortality in the United States, August 2001

2: http://www.defenders.org/habitat/renew/wind.html

3: Source: http://www.flap.org

PROFILE

Bats and Wind Energy Cooperative (BWEC)

Bat research is underway

Lessons learned.

Lessons were learned from one of the first major wind farm projects in North America. Established in the 1970s, Altamont Pass was problematic for birds. As turbines at Altamont are replaced, newer, fewer and bigger models take their place, making air space around the wind turbines safer for birds.

Today, the wind energy industry has put procedures in place to enhance our understanding of birds and how they interrelate with wind turbines. The modern wind farm undergoes a series of environmental assessments before being approved. In this process, the proposed site will be monitored and bird populations evaluated. What kinds of birds are on site? What are their habits, flight patterns? Do they nest in the area or simply fly through? Questions like these are answered in an effort to better understand on-site bird populations and to mitigate their potential interactions with wind turbines. Once built, further monitoring takes place to better understand the ongoing relationship between birds and the wind farm.

Watching out for wildlife.

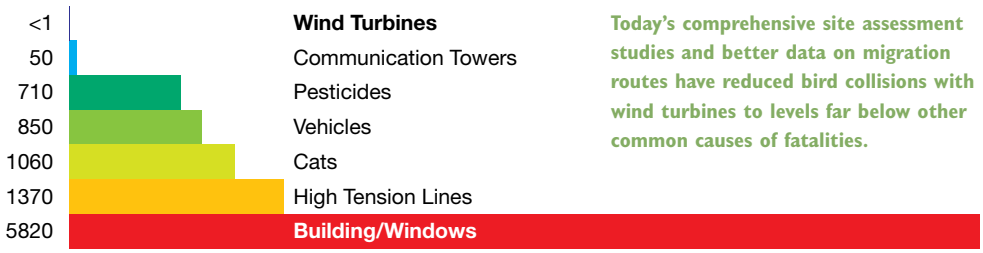
There is an emerging concern about the impact certain wind farms might have on bat populations. As of today, bats and their interactions with wind turbines are far less understood than those of birds.

The wind energy industry has taken a proactive approach to working on this important issue. In the US, conservationists, industry officials and federal agencies are joining forces to address this, as yet, little understood relationship between bats and wind energy. In Canada, we are starting to do the same.

The wind energy industry is very interested in learning more about bats to address any potential problems.[4]

Causes of Bird Fatalities[5]

Number per 10,000 Fatalities



Today's comprehensive site assessment studies and better data on migration routes have reduced bird collisions with wind turbines to levels far below other common causes of fatalities.

Bat behaviour in general, and collisions with wind turbines specifically, is largely understudied. To improve our understanding of this interaction, the Bats and Wind Energy Cooperative (BWEC) was formed in 2003.

BWEC is an alliance of Bat Conservation International, the US Fish and Wildlife Service, the American Wind Energy Association and the National Renewable Energy Laboratory of the US Department of Energy.

During the fall of 2004, BWEC researchers conducted the most detailed studies ever performed on bat fatalities at wind sites. The primary goal of this research was to improve fatality search methods and observe bat/turbine interactions. Research techniques included video and thermal imaging which provided new insights on flight, predation and roosting behaviours. This was the first time these observations were made in the rotor-swept zone of operating turbines.

This and on-going research by BWEC is rapidly advancing our understanding of bat fatalities at wind farms and is only possible with the continued support of the wind energy industry.

To review this, and other research, including the study mentioned above, please visit: http://www.batcon.org/home/index.asp?idPage=55 &idSubPage=30

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CanWEA acknowledges the contribution of Natural Resources Canada.

4: http://www.nationalwind.org/workgroups/wildlife/publications_catalog.pdf

5: Source: A Summary and Comparison of Bird Mortality from Anthropogenic Causes with an Emphasis on Collisions, Erickson, et. al

The sights and sounds of wind.

People have a lot of questions about wind turbines and what they look and sound like. Are they really big? How much sound do they make? What will it look like when a wind farm goes up in my community?

Far from being disinterested, developers want to answer these questions and more because building wind farms that address the needs and wishes of local communities is the way to build an industry that benefits all Canadians.

photos courtesy of Vision Quest

"Tour of the windmills was a surprise and very informative. Great exhibit lovely place" From the visitor guest book in the interpretive centre of the Wind Energy Institute of Canada

It's not just the view – it's the vision that counts.

The eye of the beholder.

Let's face it. There's no hiding a wind turbine. They are 30 stories tall and tend to be set in clusters. Having said that, many people find beauty and elegance in these sleek and modern structures. Many of these people are residents who live closest to wind farms.

Studies in Denmark and in other European countries where wind farms are prevalent show that proximity to the nearest turbine seems to have a surprising effect on people's attitudes. Residents who live closer than 500 meters to the nearest wind turbine tend to be even more positive about wind energy than people sited further away. [1]

Designing for the future.

Developers recognize that visual impacts are a concern for the community. That's why so much effort goes into the planning stages of a wind energy project. Developers are always looking for new and innovative ways to reduce impacts and gain the consent of the community.

There are computer modelling programs that use Geographic Information Systems (GIS) technology to show residents exactly what the landscape will look like once the farm is installed. These programs provide the community with visual answers to their questions. Residents get to see the farm from different perspectives, including how it may look from the local community centre or church – or even someone's living room window.

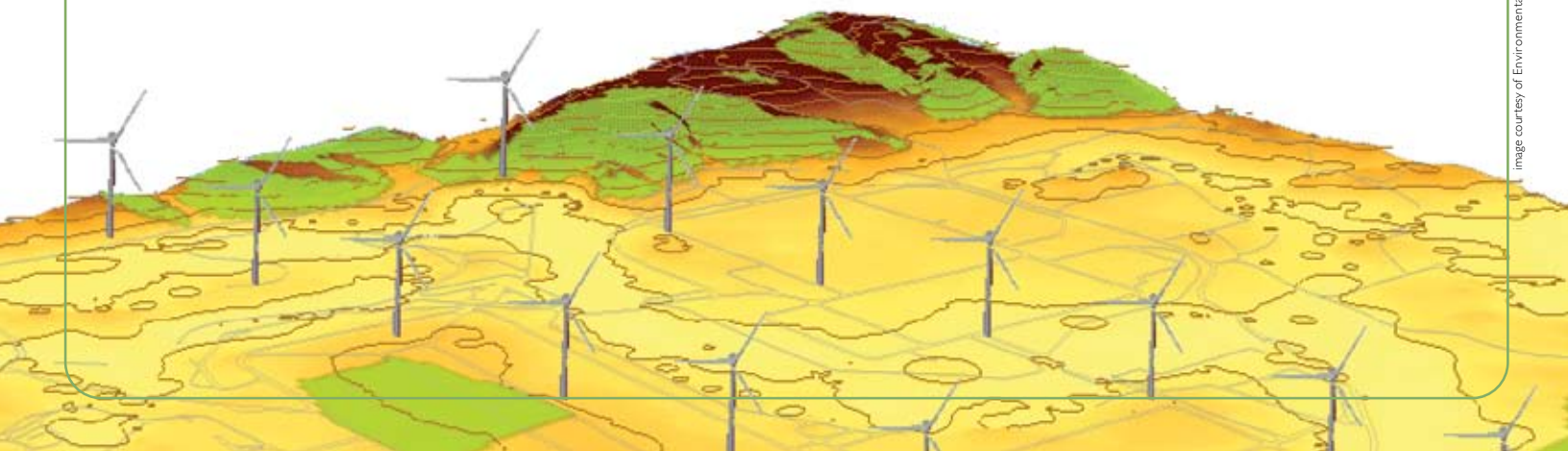


image courtesy of Environmental Systems Research Institute, Inc. (ESRI Canada)

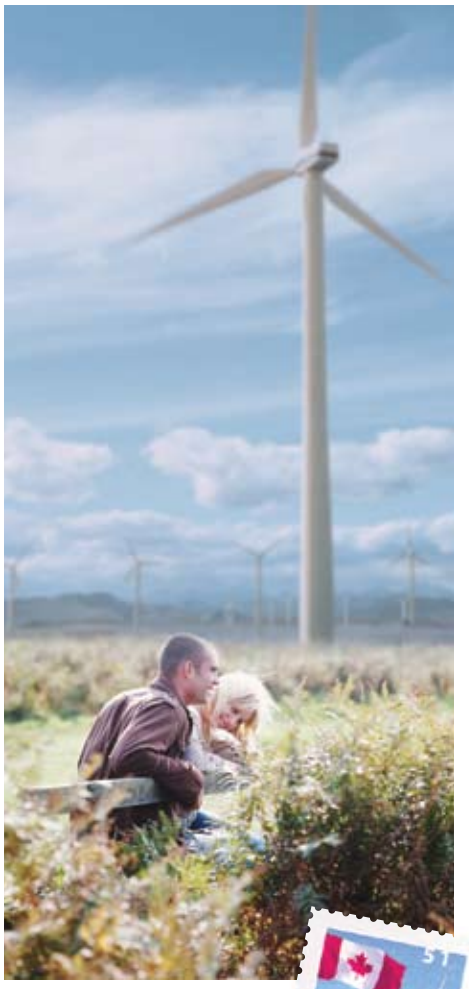
photo courtesy of Vision Quest

CASE STUDY

Wind Energy Institute of Canada, PEI

Site draws 60,000 visitors annually

photo courtesy of WEIC



Noise reduction.

Are modern wind turbines noisy? The answer is no. Any mechanical device has the potential for mechanical noise – the sound that is emitted when two parts rub together. The good news is that this type of sound has virtually disappeared from today's well-engineered modern turbine.

In fact, turbines are so quiet that it's possible to carry on a normal conversation at the base.[2] At 300 meters from the base, the sound they make has been electronically measured and compared to a whispering voice.

Wind turbines operate under windy conditions, the harder the wind blows the faster the turbines spin. However, much of the sound from the blades is masked by the sound of the wind itself and of the accompanying sound of rustling leaves in nearby trees and shrubs.[3]

Wind farms and popular culture.

Where can wind turbines and wind farms be seen today? If you live near a wind farm, you can always visit. If you don't, you'd be surprised at where wind turbines are turning up. Look closely and you'll see them in TV ads, music videos and in other forms of popular culture. The wind turbine has even made it onto the 51¢ postage stamp from Canada Post!

Good science constantly helps us discover new information and unexpected results.

The Atlantic Wind Test Site was established in 1980 and by summer 2006 had evolved into the Wind Energy Institute of Canada (WEICan) – a research and testing facility for wind turbine technology. It is funded 70% by Natural Resources Canada and 30% by PEI Energy Corporation.

This site is home to the most diverse mix of wind turbine designs you'll find anywhere on the planet. Small wind turbines; large capacity turbines; giant "egg beater" vertical axis turbines – and all have generated one completely unexpected result **– tourism!**

The almost universal comment from the 60,000 visitors this site attracts each year is their astonishment at how quiet and how beautiful these wind turbines are.

Rave reviews don't end there. Because of the space constraints for WEICan, wind turbines are closer to local dwellings and roadways than would be permitted with present siting guidelines. Despite this, there has not been a single complaint from local residents. On the contrary, locals take great pride in 'their' wind plant and regularly hike along the access roads. To find out more about WEICan, please visit: **www.weican.ca**

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CanWEA acknowledges the contribution of Natural Resources Canada.

1: Andersen et al. (1997). Rapport om hvordan en dansk kommune blev selvforsynende med ren vindenergi og skabte ny indkomst til kommunens borgere, Nordvestjysk Folkecenter for Vedvarende Energi. Bishop et Proctor (1994).

2: http://www.awea.org/pubs/factsheets/WE_Noise.pdf

3: http://www.bwea.com/ref/noise.html

The win/win of wind energy.


photo courtesy of Vision Quest

If wind turbines are big, wind farms are even bigger.

So how can a large wind energy project respect the lay of the land? The answer lies in how they occupy only a fraction of the land they are sited on and work in harmony with its established uses. In rural settings, farming and ranching continue undisturbed. Even in urban areas, wind farms can fit in with the local streetscape.

Wind energy fits with the way we live today. This is the unique win/win of wind. Minimal land use. No emissions. Just a clean and renewable way to produce energy that peacefully co-exists with its neighbours.

Understanding the lay of the land.

The small footprint of wind.

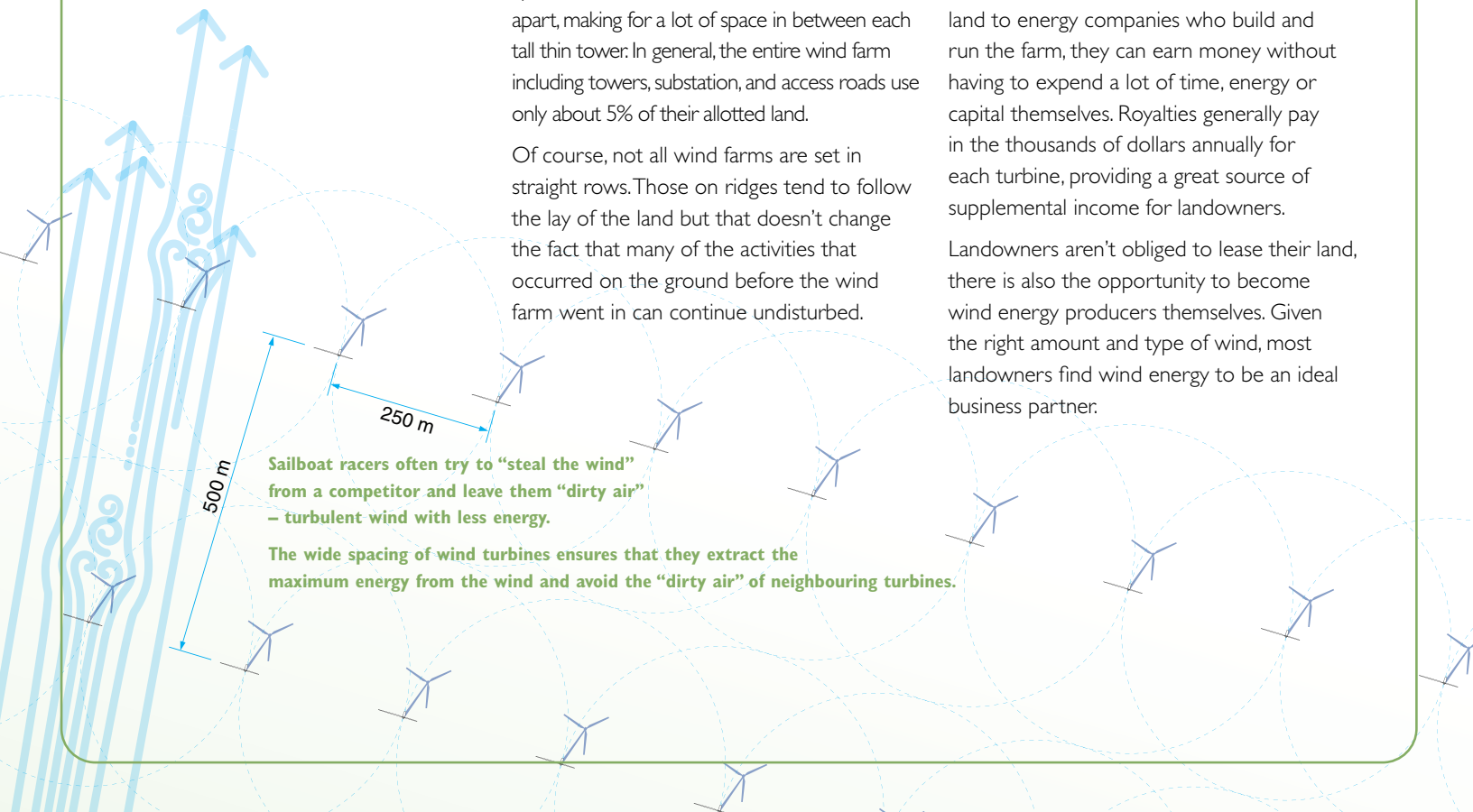
Turbines are tall – but they are also relatively slim. Generally each tower base is only 8 meters across and each turbine spaced 250 meters apart. Rows of turbines are set 1/2 kilometer apart, making for a lot of space in between each tall thin tower. In general, the entire wind farm including towers, substation, and access roads use only about 5% of their allotted land.

Of course, not all wind farms are set in straight rows. Those on ridges tend to follow the lay of the land but that doesn't change the fact that many of the activities that occurred on the ground before the wind farm went in can continue undisturbed.

The ideal business partner.

Wind energy is a special kind of commodity because it can deliver stable financial rewards with little or no effort on the part of landowners. Since landowners lease their land to energy companies who build and run the farm, they can earn money without having to expend a lot of time, energy or capital themselves. Royalties generally pay in the thousands of dollars annually for each turbine, providing a great source of supplemental income for landowners.

Landowners aren't obliged to lease their land, there is also the opportunity to become wind energy producers themselves. Given the right amount and type of wind, most landowners find wind energy to be an ideal business partner.



Sailboat racers often try to "steal the wind" from a competitor and leave them "dirty air" – turbulent wind with less energy.

The wide spacing of wind turbines ensures that they extract the maximum energy from the wind and avoid the "dirty air" of neighbouring turbines.


photo courtesy of Vision Quest

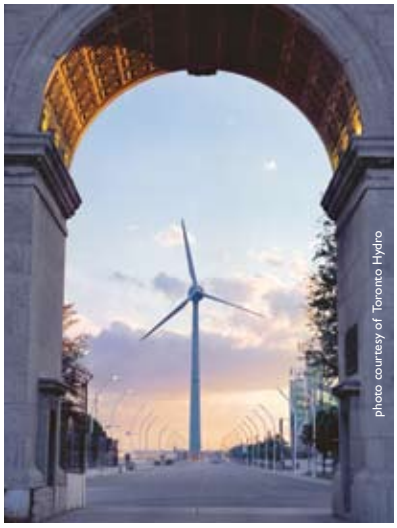


photo courtesy of Toronto Hydro

Surprising sites.

Wind farms can be found throughout Canada – and in some surprising places. Head Smashed in Buffalo Jump, a World Heritage site located in southern Alberta is one such example. Several wind farms have been located within view of this Heritage Site. There is also a wind farm in downtown Toronto and one on the docks of Hamburg, Germany. Wind farms continue to surprise and delight!

Wind farms and farming.

Rural communities are in a great position to develop wind energy. Wind farms and farming have a well-established and harmonious relationship in the US[1] and Europe. Farmers and ranchers in North America are fast realizing that they can use their land not only to raise cattle and grow crops but to harvest electricity from wind.

Imagine a farm or a ranch with a wind farm on it. Crops can be planted right up to the base of the turbines and harvested with the usual farm machinery, and because the presence of turbines doesn't disturb livestock, the sheep, cows and horses can continue to graze in and around the towers.

Wind farms do more than co-exist peacefully with agricultural uses of land, they help preserve what's precious to us. Because they provide an alternative income stream for farmers and ranchers, wind farms help farmers and ranchers weather the ups and downs of farming. Wind energy helps to preserve the rural way of life in Canada giving farmers, ranchers and their children the option of staying on the farm.[2]


photo courtesy of Brookfield Power

PROFILE

John Deere Wind Energy

Wind energy investment program for farmers in USA

John Deere has a vested interest in helping rural communities prosper. They understand the challenges faced by farmers and know wind energy can provide a new revenue stream for land owners where a good wind resource exists. To help make this revenue stream a reality, John Deere created John Deere Wind Energy (JDWE) for US farmers. Research is currently underway for a similar program in Canada.

JDWE can participate in economically viable wind energy projects in a debt and equity investor role. Typically, land owners participate as limited partners and, ultimately gain ownership of the project assets and the economic benefits.

At this time, JDWE is investing in utility-scale wind projects in the USA. This generally means projects with multiple wind turbines with a minimum capacity of 1.25 megawatts. This is generally due to the fixed cost for these projects and the ability to secure attractive power purchase agreements from utility companies or, for some projects, rural electric cooperatives or private companies. JDWE can work with developers and land owners to evaluate potential projects.

For more information on JDWE please visit: http://www.deere.com/en_US/jdc/product_financing/wind_energy/about/index.html

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1: http://www.rurdev.usda.gov/rbs/farmbill/index.html
2: http://www.ontario-sea.org/CommunityWind/CommunityWind.html

The business of wind.

Wind energy is big business. Worldwide, it was worth over $25 billion dollars in 2005.[1] The potential for growth is astounding with the industry now doubling in size every three years. Several countries count on wind energy to provide 5% of their electricity and Denmark now gets 20% of their electricity from wind.

So where does this leave us? In Canada, we have a burgeoning industry and the future is full of potential both in terms of increased output, investment and job growth for Canadian workers.

photo courtesy of Vision Quest

Leading with the wind.

The people behind wind energy.

There are a lot of people and companies that stand behind wind energy in Canada. These firms include the manufacturers who build components, project developers who oversee the creation of wind farms, consultants who conduct all the necessary assessment needed for project approval, and the local construction teams who actually build the farms themselves. All these people and the hundreds of companies that make up the wind energy industry have very different specialties. They are bound together, however, by their belief that wind energy represents a tremendous economic opportunity for all Canadians.

A global snapshot.

So how big is the global wind energy industry? The amount of electricity generated by wind power is growing steadily and predicted to continue its rise. Wind farms now produce 59,000 megawatts of power worldwide. That's the equivalent of producing enough electricity to power 18 million households.

Aside from creating electricity, the wind energy industry also creates jobs. Where the wind energy industry is most prominent there is a well-established track record of permanent jobs. Many of these jobs are in manufacturing the turbines and components themselves with large multinational companies providing most of the work. There are 100,000 people employed in the wind energy industry in Denmark, Germany and Spain. In Canada, we foresee that steady growth in the industry will provide an increasing number of jobs within the industry.

In addition to employment in the development, installation and service sectors – Canada manufactures most of the steel towers for our wind farms. More than 300 people currently work at wind turbine tower manufacturing facilities in Quebec and recent investments of more than $100 million are supporting new manufacturing facilities in Saskatchewan and Ontario. Each of these 132,000 kg towers contain enough steel to manufacture 206 average North American automobiles.*

*Based on 1.8 MW wind turbine towers

Government and wind energy.

In Canada, both federal and provincial levels of government believe in renewable energy – and they believe in wind energy in particular. At the federal level, the Wind Power Production Incentive (WPPI)[2] subsidizes a portion of the cost of establishing a wind farm for the first ten years. At the provincial level many targets have been set for renewable energy, which provincial utility companies are encouraged to meet. In Canada, our government has recognized that wind energy is good for Canada and good for Canadians.

CanWEA and you

The Canadian Wind Energy Association (CanWEA) is the voice of Canada's wind energy industry. We are a non-profit trade association that promotes the appropriate development and application of all aspects of wind energy in Canada, including the creation of a suitable policy environment.

CanWEA is proud to represent our more than 230 members. Our goal is to develop policy, communicate with stakeholders and advocate for the industry and for the benefit of all Canadians who want a clean and renewable energy source to power us into the future. Want to learn more about what we do? Visit us at www.canwea.ca today.

Canada's wind energy industry.

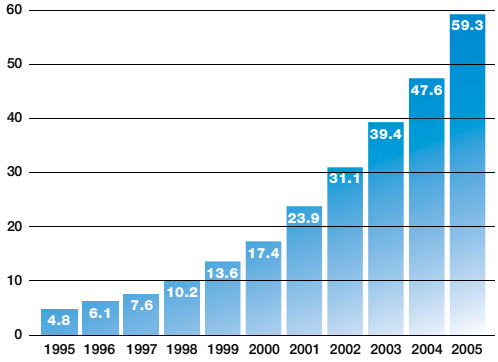
Although substantially smaller than our European cousins, the Canadian wind energy industry is showing impressive growth with an average annual increase of over 30% for the last 5 years.

A recent report shows that wind energy firms are optimistic about future growth – and they aren't alone. Canadians too believe in the power of the wind energy industry to create jobs. A recent survey showed that 88% of Canadians believe that wind energy can play a role in economic development and job creation. In 2005, the total annual payroll associated with the jobs created in Canada is just under $50 million per year.[3]

We've also set out some exciting challenges for the Canadian Wind Energy industry. One of our objectives is to have 10,000 megawatts of wind-generated electricity by 2010 – the same year that Canada will host the Winter Olympics. This has the potential to generate over $20 billion dollars of industry investment.

Want to learn more about the companies that power the wind energy industry? Go to www.canwea.ca/en/membersdirectory.html

Global cumulative installed capacity in Gigawatts (1,000 MW)



According to the Global World Energy Council, during the last decade, global wind energy capacity has doubled every 3 years – about a 30% increase annually.

This industry now employs 235,000 people worldwide.

PROFILE

Heavyweights of wind

The 5 biggest wind turbine manufacturers

photo courtesy of Vision Quest

Denmark's Vestas Wind Systems, with 34% market share[4], is the world's largest wind turbine manufacturer. Vestas employs 10,600 people and has production facilities in Denmark, Germany, India, Italy, UK, Spain, Sweden, Norway and Australia. In 2005, annual revenues reached $4.94 billion and they sold wind turbines with a total capacity of 3,185 MW worldwide.[5]

Spain's Gamesa, with 18% market share[4], employs 8,203 people and is the only fully integrated wind power service provider in the world. Wind turbine manufacturing accounts for 2/3 of their annual revenues of $2.54 billion and wind farm development makes up the remaining 1/3.[6]

Enercon (Germany), GE Energy (USA) and Siemens (Germany) account for 15%, 11% and 6% of the global market respectively.[4]

Enercon has sales offices in 17 countries and owns a majority share of Enercon India. They have installed over 9,000 wind turbines globally with a total capacity of 9.1 GW.

GE Energy's annual revenues exceed $2 billion. Their 2005 wind turbine revenues were up 400% over 2002, which was their first year of activity in the wind energy sector.

Siemens entered the wind energy business in 2004, by purchasing Bonus – a Danish firm, with a workforce of over 750 and annual sales of $417 million.

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1: The Global Wind Energy Council, 17/02/2006
2: see: www.canren.gc.ca/programs/index.asp
3: Economic Impacts of the Canadian Wind Energy Industry, Insightrix Research
4: BTM Consult (2004 figures): www.sustainablebusiness.com/features/feature_printable.cfm?ID=1313
5: http://www.investindk.com/visNyhed.asp?artikelID=15074
6: http://www.goodbody.ie/news/mt20060213.html

Making wind energy a reality.

photos courtesy of SaskPower

Building a wind farm is a very large undertaking and proposals pass through many stages before they can be approved and built. Many developers are looking into the potential for wind energy in a variety of communities across the country.

The cost of building wind farms ranges from about 1.8 to 2.2 million dollars per megawatt. No matter the size of the wind farm, planning, assessments, site selection, construction and a whole lot more must be completed before it can begin contributing clean energy to the marketplace.

Building a wind farm.

Step 1: Identifying potential sites.

Site selection is an important first step in building a wind farm. At this stage the wind resource is evaluated and other key factors are taken into consideration. Factors like how the electricity will be delivered… what are the obstacles, if any, to harvesting the wind… and how does the community feel about the project.

An example of the types of studies conducted include field trips by developers, the installation of a meteorological tower to assess the strength and consistency of the wind, transmission studies to examine the proximity and capacity of existing equipment and meeting with the landowner for initial discussions of lease agreements, terms and more.

This screening process results in a short list of potential sites that meet all of these critical requirements for a successful project.

Step 2: Site preparation.

Should a proposed site be successful in its initial stages, it then moves onto the second stage where a series of more thorough studies take place. At this stage, environmental assessments are conducted to identify any impacts to wildlife, the landscape, and established land use. Should impacts be identified, a plan to resolve them needs to be developed.

It's at this stage when the numbers get crunched and all the paper work begins: calculating the economic viability of the project, starting applications for permits, preparing documents for all levels of government, meeting with the community, figuring out contractor costs and more. Even archaeological assessments are conducted.

photo courtesy of Vision Quest

CASE STUDY

Melancthon I Wind Project
Shelburne, ON

www.canhydro.com

Step 3: Building the farm.

This is the stage when the project gets its green light. Everything goes into final design and construction. The service roads are built, foundations are prepared, turbines are shipped to the site and the construction crews install the equipment.

The costs of construction and, more significantly, the turbines themselves make up the majority of costs at this stage. There will be ongoing operations and maintenance costs to consider as well. However, unlike some forms of conventional energy, wind energy doesn't incur ongoing fuel costs – a contributing factor towards its economic viability and competitive edge.

"According to Insightrix[1], the Canadian wind industry's 2004 expenditures amounted to roughly $400 million. Of that, two thirds is spent on Canadian goods & services."

Decreasing costs.

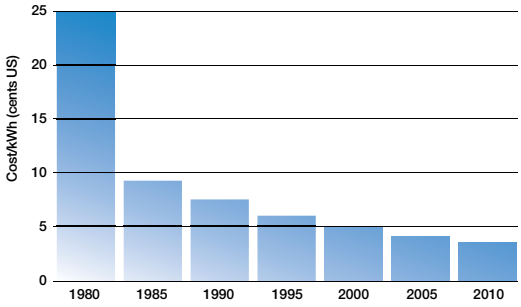
Aside from fuel, there are other factors that will lower the cost of energy generated from wind. Wind energy is built on a technology that improves every year and each improvement helps bring down the cost of generating electricity. Lighter materials enable taller towers to support larger blades that capture more energy – increasing the efficiency of each new generation of wind turbine. Increased efficiency means that more energy can be generated from each turbine.

As efficiency continues to increase, generation costs keep coming down – 80% in the last twenty years.[2] Power producers like that math, which helps explain the 38% average annual growth in Canada over the last 5 years. In 2005, growth accelerated to 54%. This steady increase in demand will fuel more Canadian manufacturing, creating jobs at home and saving shipping and transportation costs.

Community commitment.

Although wind farms come in different shapes and sizes, all of them have one thing in common: Wind farms, and the power producers who run them, want to be good neighbours and great corporate citizens by becoming a vital part of the community itself.

Steady Decrease in Cost of Wind Energy



Technological improvements such as lightweight materials have enabled the development of bigger, more efficient wind turbines. These changes have contributed to the 80% decrease in wind energy costs over the last 2 decades.[2]

Canadian Hydro Developers Inc. completed this ambitious project in record time. After only nine months of construction and commissioning activities, the Melancthon I Wind Project went on line March 4, 2006 – about one month ahead of schedule. This is Ontario's first wind plant to become commercially operational under Ontario's new Renewable Energy Supply (RES) Contract.

This RES contract reduces some of the financial risk for renewable power producers by giving them a guaranteed rate for the power they produce for a 20 year term.

This $126 million dollar wind facility consists of 45 GE wind turbines, each rated at 1.5 MW for a total capacity of 67.5 MW – enough green power to supply more than 20,000 households. Additional benefits include:

- number of area companies employed: >25
- value of area contracts: >$15 million
- construction man-years created: 77
- full-time operating positions: 8
- annual average power output: ±195 GWh

For more info on the Melancthon Wind Project, please visit: www.mgwindpower.info

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CanWEA acknowledges the contribution of Natural Resources Canada.

1: Economic Impacts of the Canadian Wind Energy Industry, February, 2005
2: Source: American Wind Energy Association

Wind energy benefits you.

Environmentally and economically sound, free from the increasing cost of fossil fuels, wind has a lot to offer Canadians. Wind farms can be built quickly – faster than many other types of power plants – and can meet our growing need for electricity in cities, towns and rural areas.

With wind energy, the cost of electricity is predictable because there are no escalating fuel costs. Investing in wind also helps us offset our use of other precious resources. That's why wind energy is a great choice for today and tomorrow.

"As fossil fuels become scarce, their price can only increase. Wind energy costs are stable because fuel isn't part of the equation."

Making the connection.

Energy without fuel.

Unlike many forms of conventional energy, which are susceptible to the increasing cost of fuel, wind energy relies on no fuel at all. Think about it. The only thing that fuels a wind farm is the wind – free and limitless.

This means that once a wind farm project is built, the price of electricity is set and it stays at that price for the lifespan of the wind turbines – approximately 20-30 years. Of course the wind is limitless and will outlast the lifespan of the turbines themselves. When they are decommissioned, newer and more efficient models of wind turbines may take their place, ensuring our ability to harvest this clean and fuel-free resource well into the future.

Conserving natural gas.

Our supply of natural gas is increasingly limited and, despite rising prices, drilling for gas is challenged to keep pace with demand and more and more of Canada's natural gas resources are located in environmentally sensitive and protected areas.

The increased use of natural gas for the production of electricity is one of the major reasons supply is tightening. But natural gas is not as efficient in creating electricity[1] as it is in heating homes or providing fuel for stoves and other activities. So why not put this precious resource to better use or save it for generations to come? Wind energy can help. More wind energy coming on line will alleviate some of the pressures on natural gas.

Natural gas – a rapidly depleting, non-renewable resource – is being used more and more to generate electricity, even though it's better suited for other uses such as home heating and cooking. Increasing demand for natural gas has helped drive prices up 400% in the last 5 years.[2]

Studies have consistently shown that increased use of wind energy will actually result in lower prices to consumers for natural gas[3] – and help conserve that resource for future generations in the process.

Wind fits with today's use of energy.

Wind farms can be built to a variety of scales. Smaller scale projects provide Canadians with the opportunity to have a diverse and well-distributed power supply. Compare that to other forms of electricity that are generated in large scale power plants. The chance of brown or black outs increases when we depend on a single large power plant. Having many smaller power producers on line is an ideal way to reduce this risk.

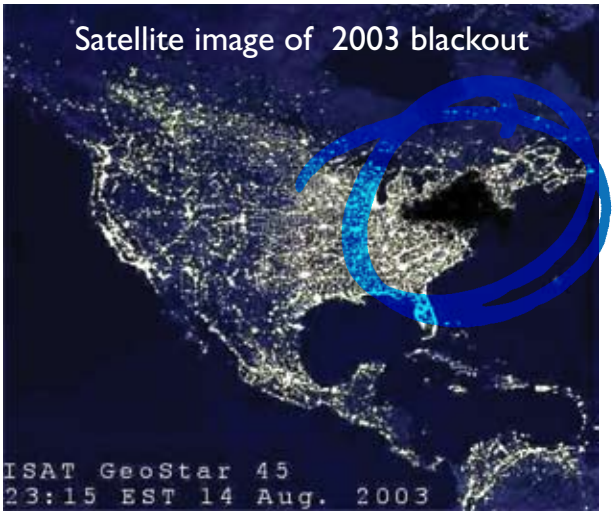
Another benefit of distributed energy is the ability to locate a wind farm close to transmission lines that aren't being used to full capacity. Transmission lines represent a major investment in infrastructure, so it's wise to use them as efficiently as possible. Electricity also loses power when it travels long distances, so the ability to locate wind farms closer to areas of demand is an additional benefit. Energy is precious; we don't want to waste it.

Energy when we need it.

In Canada, we are most dependent on energy in the winter months, when it's cold. Luckily for us, the wind also blows hardest in these cold winter months meaning that wind energy production hits its peak just as our critical demand for energy does. Just another way wind energy can be there for us when we need it most.

Cold winter winds are also denser than winds in warmer seasons. Denser winds contain more energy, so provide even more power potential when we need it most.

Think of throwing a hardball or a whiffle ball as hard as you can. The dense hardball travels much farther because it has more kinetic energy.



The "cascading failures" of the August 14, 2003 blackout affected a 9,300 square mile area and 50 million people. It took just 3 minutes to shut down 21 power plants.

Several nuclear plants were not restarted for days, due to the extensive and time-consuming restart procedures they must go through to ensure safe operation.

In contrast, wind plants were able to start up nearly immediately after the safety of the grid was assured.[5]

CASE STUDY

Austin Energy

GreenChoice® program is a huge success with consumers[4]

When Austin Energy, the publicly owned utility in Austin Texas, launched their GreenChoice® program in 2000, customers had the option of purchasing green power at a premium price – but a price that is now guaranteed to remain stable through June 30, 2015. Their decision to opt for long-term stability paid off in the fall of 2005, when escalating natural gas prices pushed Austin Energy's conventional electricity costs higher than their GreenChoice® power pricing.

Long-term, fixed price contracts for green energy were negotiated with power producers that include the wind farms in McCamey and Sweetwater Texas. Austin Energy purchases 100% of the electricity produced by these 120 turbines – enough to power 35,000 Austin homes. Austin Energy, in turn, provides power at a fixed price to more than 7,000 retail customers and over 400 corporate customers – saving them about US $670,000 annually.

Due to an overwhelming demand, Austin Energy's GreenChoice® program is now fully subscribed leaving the utility searching for more clean energy for waiting customers.

Canadian utilities are following Austin's example. For a list of companies across Canada that sell green power we invite you to visit: **www.canwea.ca/en/GreenPower.html**

Canadian Wind Energy Association
Powering Canada's future naturally
Toll Free: 1.800.922.6932
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CanWEA acknowledges the contribution of Natural Resources Canada.

1: Source: http://www.naturalgas.org/overview/uses_eletrical.asp
2: Source: Canadian Association of Petroleum Producers
3: Easing the Natural Gas Crisis: Reducing Natural Gas Prices through Increased Deployment of Renewable Energy and Energy Efficiency, Wiser & Bolinger
4: Source: Austin Energy (http://www.austinenergy.com)
5: Source: National Association of State PIRGs

Why wind is right – right now.


photo courtesy of GE

Wind energy has a lot to offer communities. Not only does it provide a new source of income for landowners whose land has a good wind resource, but it also provides jobs in communities and a new source of tax revenue for all.

There's more for communities to like about wind energy than the fact that it's an innovative technology. It never pollutes the air, depletes water resources or produces waste of any kind, making it a wise environmental choice for communities across the country.

"It is estimated that wind energy creates 27% more jobs than coal-electric and 66% more than natural gas-electric per unit of energy" [1]

Believing in the power of wind.

Wind and rural Canada.

Rural economies tend to have traditional ties to the land and nature. In the last few years, however, industries associated with rural economies have gone through some pretty tough times – mining, forestry, fisheries, even local farms have seen their prospects decline. But there is a bright spot on the horizon and that bright spot is wind energy.

Wind farms provide a new tax revenue stream for local municipalities, which can be used for the benefit of all. New choices can be made – local initiatives like community centres, roads, park maintenance and more can be funded in part by this new tax base.

Compared to other types of energy generation, wind energy uses virtually no water; local water resources can be preserved for uses like irrigation, drinking water, fishing or simply left alone in its natural state to be enjoyed by all. Wind energy doesn't interfere with the activities of rural life like farming and raising cattle. If anything, the revenue from a wind farm can help preserve and protect traditional uses of rural lands from other forms of development.

Land lease payments

With wind energy supplementing their earnings, farmers and ranchers can enjoy the benefits of a new, low-maintenance revenue stream while preserving their traditional way of life. But it's not only the farmers and ranchers who benefit from wind energy. All landowners with a good wind resource, not just farmers and ranchers, have the potential to benefit from wind energy.

Land lease payments are the negotiated terms of agreement between the developer and landowner. They include specific details in the form of a binding contract in which the landowner agrees to let their land be used in exchange for a percentage of wind farm revenue or a flat fee. Of course, details vary greatly from project to project, but landowners can see revenue in the thousands of dollars annually for each installed turbine.

photo courtesy of Vision Quest

CASE STUDY

Pincher Creek, AB

This community is blown away by wind energy's economic benefits

Wind energy and jobs.

With wind energy come jobs in project development, manufacturing, construction, operations and maintenance. As of 2006, there were more than 100,000 people employed in the wind energy industry in Denmark, Germany and Spain.

Currently in Canada, the construction phase of a wind farm development carries the most employment opportunities. There are also permanent jobs created in the operation and maintenance of wind farms.

Right now, most manufacturing jobs are where the demand for wind energy is greatest – in Europe and the US. But once Canada installs more wind farms, we expect to establish a local manufacturing base to meet increased demand.

photo courtesy of Brookfield Power

A natural tourist attraction.

Wind farms are objects of fascination for many and, as such, wind farms can generate tourism for the local community. Some wind farms get upwards of 60,000 visits a year and the benefits of even drawing a fraction of that amount of visitors to a community can be felt by many businesses including shops, restaurants and hotels and motels.

Wind farms generate a lot more than electricity for the community they're in.

They generate employment opportunities – both in the labour-intensive construction phase as well as permanent positions in operations and maintenance.

They generate new tourism opportunities and an increase in the purchase of local goods and services.

And they generate a new tax base that can help fund everything from street improvements to a new community centre.

Wind farms spark lots of new possibilities.

Pincher Creek Municipal District and Town cover a 3,366 square kilometer area in Alberta's Southwest. The rapid 3,000' drop in elevation from the Rocky Mountains to prairie grasslands provides an excellent wind resource that was first developed in 1993 with the construction of a 19 MW wind farm.

By June, 2006, Pincher Creek was home to 169 wind turbines with an installed capacity of 167.45 MW – enough to supply 51,000 homes.

In the last decade, wind energy projects have injected over $10 million into the local economy through the purchase of local supplies and services.

Long-term benefits include:

- Establishment of 3 new company offices.
- 21 new full-time jobs, with a $1.4 million annual payroll.
- Estimated $900,000 in municipal taxes
- Estimated lease payments to landowners of $3,000/MW for every installed turbine.

Spin-off benefits include tourism revenue from visitors from as far away as Russia; $5,000 in annual sales of clothing and souvenirs branded with the "Naturally Powerful Pincher Creek" logo.

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CanWEA acknowledges the contribution of Natural Resources Canada.

1: Source: A.K. Sanghi., Economic Impacts of Electricity Supply Options, New York State Energy Office