

# 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 285,000 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.

### 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 285,000 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.

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



photo courtesy of Vision Quest

### Environment Canada's Wind Energy Atlas

[www.windatlas.ca](http://www.windatlas.ca)



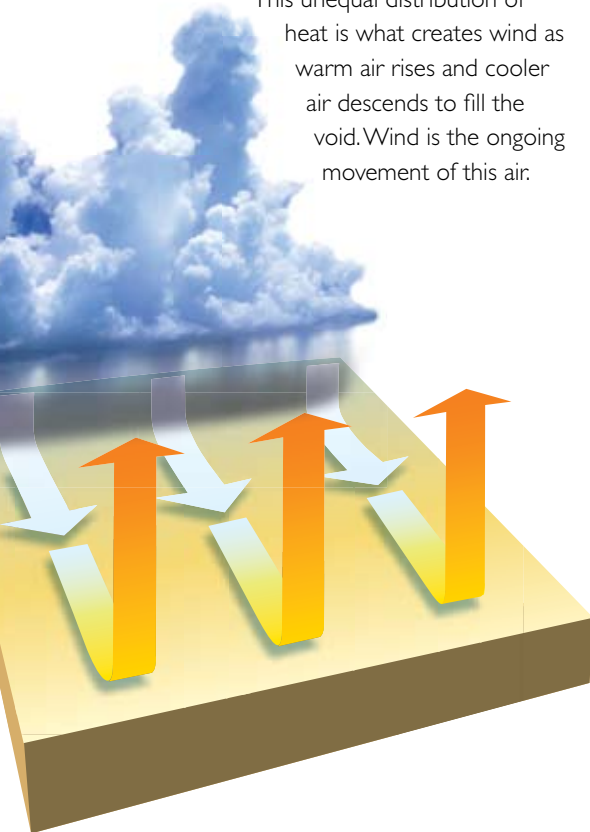
**“Q. What are the advantages of setting wind turbines high in the air where the wind speed might be faster?”**

**A. The higher the wind speed, the more energy generated. For instance, the doubling of wind speed generates eight times more power.”**

### 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 hundreds of feet 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.

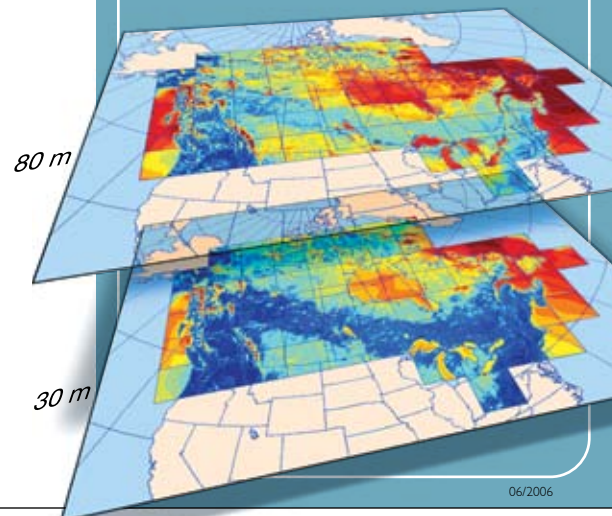
**As the sun warms the earth, it in turn, warms the air above it, making it less dense or lighter. As the light air rises, it creates a low pressure zone near the ground. Air from surrounding cooler areas rushes in to balance the pressure. These are called local winds.**

**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.**

**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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**Canadian Wind Energy Association**  
*Powering Canada's future naturally*

Suite 320, 220 Laurier Ave. W  
Ottawa, Ontario  
Canada K1P 5Z9

Toll Free: 1.800.922.6932  
T: 613.234.8716 / F: 613.234.5642  
[www.canwea.ca](http://www.canwea.ca)

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