



An Introduction to

*Stand-Alone*

# Wind Energy *Systems*



Natural Resources  
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Canada

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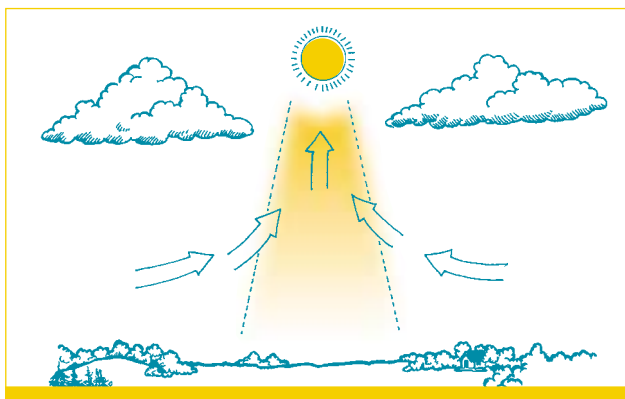
**One of nature's renewable energy resources, the wind can be harnessed to provide an environmentally friendly and reliable source of energy.**

## **Wind Energy Systems**

Reliable, cost-effective and environmentally friendly, wind energy is the ideal power source for many applications. Wind energy systems come in many sizes, from very small micro systems, which can be mounted on a pole, to 1.5 megawatt turbines that can supply energy to the electrical grid. Most stand-alone systems fall into one of three categories: micro systems (100 W or less), mini systems (100 W to 10 kW) and small systems (10 kW to 50 kW).

Wind energy systems require a fairly constant wind. They are designed to “cut in,” or begin operating, at speeds greater than 15 km/h and “cut out” at very high wind speeds to protect themselves from damage. When calculating whether your site has enough wind energy to effectively operate a wind energy system, the average annual wind speed and the number of days the wind is above the “cut in” point is very important.

The wind, of course, is not always present with enough velocity to power a wind energy system. This is why many systems are used in combination with another energy source such as solar panels or a diesel generator. Other types of wind energy systems are connected to batteries. When the wind falls below the “cut in” speed, the batteries are used. When the wind is sufficient, the turbines charge the batteries. Some systems, such as mechanical water pumps, do not need a back up power supply or batteries.



▲ *Wind is caused by movement of air.*

Initially, wind energy systems tend to cost more than conventional alternatives such as gasoline generators, but over the long term they can provide inexpensive, low-maintenance power.

# Uses of Wind Energy Systems

Wind energy systems are a very reliable and versatile technology which have been used for hundreds of years for different purposes.

## Water Pumping

The wind has been used as a reliable and inexpensive water pumping power source for generations. Either a mechanical or electric water pumping system could be ideal for rural and remote locations to supply livestock, a household or even a small community.

## Recreation

Using the wind as an energy source for your cottage or boat could be efficient and inexpensive when compared to fossil fuel generators. An environmentally friendly wind energy system could power lights, radios and small appliances.

## Farm and Ranch

Used for centuries by farmers to pump water, today's wind energy systems can do much more for a modern agricultural operation. Because they are ideal where remote, low voltage power is required, wind energy electrical generators are used for such farm systems as electric fences and yard lights.



▲ *Mechanical water pumping system.*

## **Home Use**

Rural home owners who want to help reduce the environmental impact of their energy use can reduce their reliance on grid power with a wind energy system. Even a mini wind energy system saves electricity generated from fossil fuels or nuclear energy.

## **Remote Communities**

In remote communities where diesel generators often supply electricity, the use of wind energy not only makes environmental sense, it makes economic sense. Larger wind energy systems can reduce reliance on expensive and greenhouse gas-producing generators.

An expert on wind energy systems can help you assess your power requirements and determine if a wind energy system is feasible for your location.

## **The Right System**

There are several types of wind energy systems. There are stand-alone systems which provide power solely from the wind. A stand-alone system may have a method for storing energy when wind conditions are not good. Usually, batteries are used for storage.

There are hybrid systems which use another source of power, perhaps solar panels or a diesel generator, to supplement the energy provided from the wind. Often, a switching mechanism starts the generator remotely when the wind turbine cuts out.

There are also mechanical systems which are used to aerate ponds or pump water for livestock, irrigation or household water supplies. More than a million mechanical systems are said to be in use in the world today, most of them on farms.



- ▲ *This remote radio repeater in Kananaskis, Alberta uses solar energy to produce electricity in addition to wind. (Photo courtesy of Nor'wester Energy Systems Ltd.)*

## Summary

Wind energy systems are a versatile and reliable method of producing energy using a renewable energy source. If wind conditions are right in your area, a wind energy system can provide years of low maintenance and inexpensive power.

## Further Information

If you are interested in purchasing a wind energy system, a good place to learn the basics is Natural Resources Canada's *Stand-Alone Wind Energy Systems: A Buyer's Guide*, or you can contact one of the groups listed below.

Natural Resources Canada  
Renewable and Electrical Energy Division  
Energy Resources Branch  
580 Booth Street, 17<sup>th</sup> Floor  
Ottawa, Ontario K1A 0E4  
Fax: (613) 995-0087  
Web site: <http://www.nrcan.gc.ca/es/erb/reed>

CANMET Energy Technology Centre  
Natural Resources Canada, 13<sup>th</sup> Floor  
580 Booth Street  
Ottawa, Ontario K1A 0E4  
Fax: (613) 996-9418  
Web site: <http://nrcan.gc.ca/es/etb>

Canadian Wind Energy Association (CANWEA)  
100, 3553 – 31<sup>st</sup> St. NW  
Calgary, Alberta T2L 2K7  
Toll Free: 1-800-9-CANWEA  
Outside Canada: (403) 289-7713  
Web site: <http://www.canwea.ca>

To order additional copies of this brochure or a copy of *Stand-Alone Wind Energy Systems: A Buyer's Guide* or other renewable energy publications, call NRCan's toll free line at 1-800-387-2000.

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Aussi disponible en français sous le titre de :  
*Introduction aux systèmes éoliens autonomes.*