

# EXPERIMENTS WITH WIND TO PRODUCE ENERGY

Curriculum: Wind Power (simple machines, weather/climatology, aerodynamics, leverage, mechanics, atmospheric pressure, and energy resources/transformations)

Grade Level: K-5

Small groups (3 to 4)

Time: Constructing equipment needed in these activities varies based on student ability levels. Activities can be done in 1 or 2 class periods.

**Summary:** There are five activities. The first activity demonstrates wind as energy, and that energy causes movement. The second activity is the construction of a weather vane. Activity three shows that different times of a day can have different wind speeds. The fourth activity deals with measuring the speed of the wind. The last activity uses a wind measuring device, constructed in the fourth activity, to approximate wind speed.

Provided by the Department of Energy's  
National Renewable Energy Laboratory  
and BP America Inc.





## 9. EXPERIMENT WITH WIND TO PRODUCE ENERGY

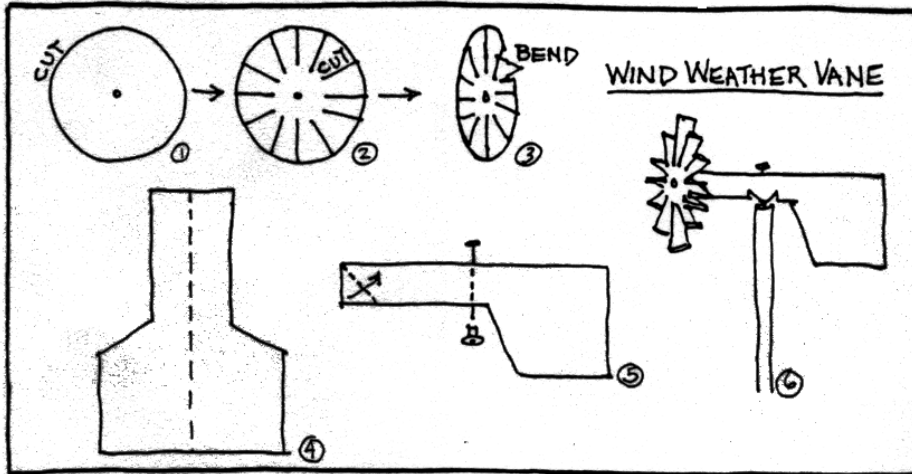
Wind can be used to generate electricity. Maybe one of your students will later do research in wind energy! Primary students should start experimenting with wind to understand that the energy in wind causes movement. Wind is also a renewable resource, but it can't be used everywhere! Choose from the following 6 activities. The last two activities "Draft Box" and "Simple Air Conditioners" explore the use of wind energy for cooling in the summer time.

### Wind Detectives

This exercise shows how the energy in wind creates movement. Most of the devices are things children are familiar with, but they may not have associated them with wind or energy. Reinforce the concept that energy causes the movement.

- Soap bubbles (make some weird bubble frames with wire)
- Milkweed puffs or other wind-carried seeds
- Pinwheels
- Kites
- Wind socks (make with cloth on a wire hoop or use a Japanese fish kite)
- Flags and banners
- Mobiles, wind chimes and bells (make these out of recycled material!)





### Wind Weather Vane

You can make a simple weather vane that serves as a windmill model, from aluminum printers' plates (used plates are available at newspaper offices) or cardboard. Cut a circular disc 8" to 12" in diameter. Make slits from the outside to within 1 1/2" of the center; these will form the blades when bent to a 45 degree angle. You can put a nail through the center for an axis, but this tends to wear out easily.

A partially "popped" rivet provides an axis and bushing in one step. Put a hole in the center and put a pop-rivet in it. Squeeze until the rivet has begun to expand but is still free to spin around the wire.

The tail vane is made from a piece folded in two, for double strength. The vertical pivot should be located in front of the broad portion of the tail vane. Use a tail as the vertical axis, making sure the whole windmill rotates freely around it.

### Helix Magic

Does it seem that some times of the day are more windy than others? Or that the wind is related to other conditions in some predictable fashion? The sun, in one way or another, is creating those up-drafts and air currents; it may be doing it locally or hundreds of miles away. In Montana there is a lot of variation with its wide open spaces and mountains.

Talk with the kids about solar energy warming the earth's surface and causing winds. Draw a few blackboard illustrations of plains and mountains. Use this simple exercise to demonstrate, on a comparatively microscopic scale, how hot air rises and created drafts.

From: Get Your Hands on Energy

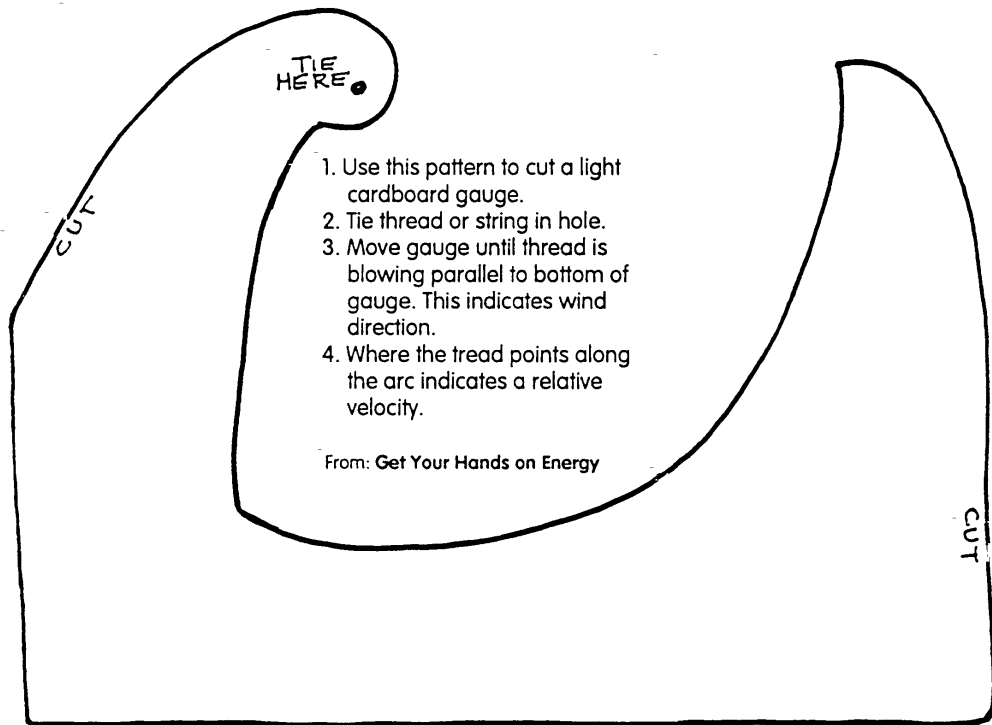




## Measuring the Wind

Here is a simple wind gauge for use in breezes. It will indicate direction and relative speeds. Use the wind gauge to find out where the wind blows strongest. Compare gauge readings. Do obstacles affect wind speeds and direction?

Edmund Scientific has precision wind gauges of various types.





## Beaufort Wind Scale

Even without fancy wind measuring equipment, it is possible to determine wind velocity by using a method called the Beaufort Scale. Keep a daily wind chart using this scale; include wind fluctuation throughout the day. This is a good way to sharpen observational skills and to become more aware of the environment 'out there'.

Windspeeds averaging 12 mph are good for electrical generation. Does a windy spot near your school have good potential for generating electricity?

CODE #	DESCRIPTION	SIGNS	M.P.H.
0	CALM	SMOKE RISES VERTICALLY	0-1
1	LIGHT AIR	SMOKE DRIFTS, WEATHERVANE DOESN'T MOVE	1-3
2	LIGHT BREEZE	WIND FELT ON FACE, LEAVES RUSTLE, WEATHER VANE MOVES	4-7
3	GENTLE BREEZE	FLAG BLOWS, LEAVES & SMALL TWIGS CONSTANTLY MOVE	8-12
4	MODERATE BREEZE	SMALL BRANCHES MOVE, PAPER BLOWS, DUST RISES	13-18
5	FRESH BREEZE	SMALL TREES SWAY, CRESTS FORM ON WATER	19-24
6	STRONG BREEZE	ELECTRIC WIRES WHISTLE, IT'S HARD TO USE UMBRELLA	25-31
7	HIGH WIND	WHOLE TREES IN MOTION, WALKING DIFFICULT	32-38
8	FRESH GALE	TWIGS BREAK, VERY HARD TO WALK	39-46
9	STRONG GALE	LARGE BRANCHES BREAK, LOOSE PARTS OF HOUSES BLOW OFF	47-54
10	WHOLE GALE	TREES UPROOTED, BUILDINGS DAMAGED, RARELY EXPERIENCED EXCEPT ON OCEAN COAST	55-63
11	STORM	WIDE SPREAD DAMAGE, AGAIN APPLIES TO OCEAN COAST	64-75
12-17	HURRICANE	DEVASTATION	75+UP

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