

STEM *Sims*™

# Wind Power



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**Do you need an idea for a scientific study?**

**Try out one of our ideas or make one of your own.**

Start learning right now about how wind can be used to generate electricity and reduce dependence on fossil fuels. Take the following brief quiz to see how much you already know about wind power. See the bottom of page 4 to check your answers.

1. About what average wind speed is needed to economically convert wind energy into electrical energy?
  - a. 2 miles per hour
  - b. 5 miles per hour
  - c. 14 miles per hour
  - d. 23 miles per hour
2. Which state in the country currently leads in producing the most wind powered electricity?
  - a. California
  - b. Florida
  - c. Connecticut
  - d. Illinois
3. As of 2010, what is the approximate height of the largest wind turbine in the world?
  - a. 50 feet
  - b. 100 feet
  - c. 180 feet
  - d. 1,000 feet
4. A typical wind turbine currently can provide the electricity needs for how many homes?
  - a. 3
  - b. 300
  - c. 30,000
  - d. 300,000
5. As of 2010, what percentage of the world's electricity needs was being met by wind powered generation?
  - a. 2.5%
  - b. 5%
  - c. 8%
  - d. 15%



## Making Your Own Electricity

A number of people have suggested that individuals should install home wind turbines to generate electricity to power their homes. A quick Internet search yields a number of do-it-yourself options for those interested in home electricity generation using wind power. But before a person takes the plunge into wind power a number of issues need to be addressed. Can you list ten different problems or issues that a person would need to tackle before they installed a wind powered electrical generation system for his/her home? See the bottom of page 4 to check your responses.

### Home Wind Power Issues/Problems

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_

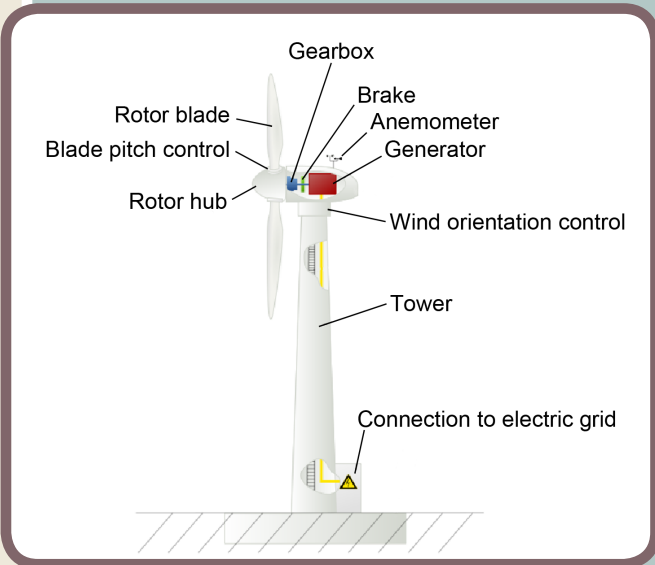
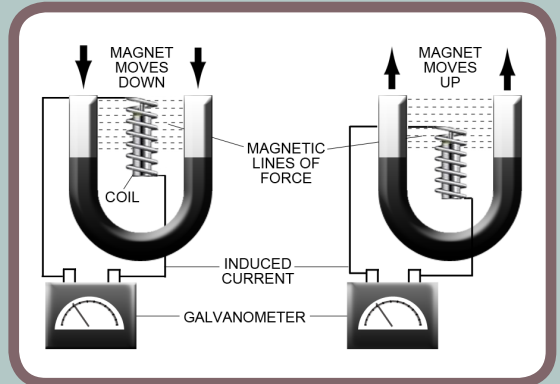


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## Turning Energy

A wind turbine is a complex machine that converts wind into electrical energy. The moving air (wind) collides with the blades. The pitch or angle of the blades changes the linear motion of the wind to rotational motion. The spinning blades turn a generator that changes the mechanical motion into a changing magnetic field and eventually, electricity. A generator is a collection of magnets surrounding a conductor, which is usually a coiled piece of wire. The wind turbine blades turn a shaft that is connected to the magnets. As the magnets rotate around the coil, they produce a voltage in the coil through a process called electromagnetic induction.

The figure to the right shows how moving a magnet relative to the coil can produce a voltage as shown on the galvanometer. This voltage can then drive electrical current through standard power lines for use in homes or businesses. The illustration below shows the parts of a wind turbine.



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**Answers:** (1) c, (2) a, (3) c, (4) b, (5) a. Page 3 Making Your Own Electricity (Possible) Answers: local building code height limits, aesthetic complaints from neighbors, noise complaints from neighbors, bat and bird fly paths into turbine blades, turbine must be higher than surrounding obstacles, must have strong average winds, how will you lift the support tower up, how will you lift the wind turbine to the top of the tower, how will you get up to do maintenance on the turbine and blades, how will you protect the turbine and tower from lightning, and many more.

The Science Fair Kits project was funded in part under the Department of Homeland Security Science and Technology Directorate grant contract #N10PC20003. Its contents are solely the responsibilities of the authors and do not necessarily represent the official views of the Department of Homeland Security.

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