Wind Farms

By Cindy Grigg

[1] *Caption: Some of the over 4000 wind turbines at Altamont Pass, in California*

[2] A windmill is a machine that uses wind energy to make mechanical energy. People have used windmills to do work for more than a thousand years. Early windmills often had four or five blades covered with cloth sails to catch the wind. Windmills were used to pump water, grind corn, and saw lumber.

[3] In 1890, a windmill pumped water to make electricity for the first time. Soon, nearly six million windmills made electricity in the United States. Then large power companies began using oil to make less costly electricity. The windmills were taken down.

[4] In the 1970s, supplies of oil ran short. The cost of oil and other types of fuel went up. People had to find a way to make electricity and run machines without using oil. Scientists and engineers began to work on the problem of energy.

[5] Windmills seemed to be a part of the answer. New kinds of windmills were designed. These have metal blades that spin easily when the wind is blowing in any direction. They can spin even when the wind is not blowing very hard.

[6] Turbines use the energy of the wind to make mechanical energy. That is then converted to electrical energy. If the mechanical energy is used directly by machinery, such as a pump or a grinding stone, the machine is usually called a windmill. If the mechanical energy is then converted to electricity, the machine is called a wind generator, wind turbine, or wind energy converter.

[7] Common modern wind turbines usually have three blades. They are often pointed into the wind by computer-controlled motors. When the wind changes direction, sensors tell the computer to adjust the turbine.

[8] Modern turbines are very efficient. They have tip speeds of up to six times the wind speed. The blades can be one hundred feet long or more. The posts they are mounted on are usually from two hundred to three hundred feet tall. This can be a hazard for birds. Wind turbines also cause noise.

[9] California has more than 14,000 wind turbines. They are located in three different areas in the state. These "wind farms" produced about one and one-half percent of California's electricity in 2004.

[10] Wind power has several advantages. It produces almost no pollution of air, water, or soil. It does not create greenhouse gases. Greenhouse gases cause global warming. It delays having to build more conventional power plants that do produce pollution and create greenhouse gases. It is a renewable resource. We are not likely to run out of wind. It has the potential to be able to meet all of the energy needs of the United States. Land where wind turbines are located can still often be used for agricultural needs.

[11] The United States gets about 1% of its energy from wind farms. The United States ranks third in the world in wind power. Germany is first and Spain is second. Around the world, wind power generates about as much power as eight nuclear power plants.

Name _____ Science Pd _____

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1. What were early windmills used for?
   - (A) Pump water
   - (B) Saw lumber
   - (C) Grind corn
   - (D) All of the above

2. How long have people used windmills?
   - (A) For a thousand years
   - (B) For five hundred years
   - (C) Since 1890

3. Why were windmills taken down in the United States?
   - (A) Power companies began using oil to make electricity cheaper.
   - (B) They couldn't use windmills to make electricity.
   - (C) Windmills didn't work very well.

4. What made people start using windmills again?
   - (A) People were worried about global warming.
   - (B) Cost of oil and other fuels went up.
   - (C) People realized that there was more wind than before.

5. Turbines use wind to make:
   - (A) Mechanical energy
   - (B) Electric power stations
   - (C) Batteries

6. Name one way windmills have improved over the years.

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7. Name two advantages to using wind power.

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8. Name two disadvantages to using wind turbines.

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