



BLOW WIND BLOW

- I. Objectives
 - a. Students will discover what causes wind
 - b. Students will learn how wind power has been used throughout history
 - c. Students will learn how electricity can be created using wind turbines
 - d. Presentation covers TEKS:
- II. Materials
 - a. Legal size paper, newspaper strips, glue, string, hole punch, map colors
- III. Introduction
 - a. What is wind? What is wind power? Is wind important? These are some of the questions we will be discussing today.
 - b. What is the first thing that comes to your mind when I say “Wind?” You probably think about wonderful West Texas dust storms. Don’t you just love it when the sky turns brown, you have grit in your teeth, small children are being blown around, and then it rains mud!!!! Show picture of the dust storm.
- IV. Introduction
 - a. What causes wind?
 - i. Wind is created by the sun! The sun heats both the land and the ocean, but the land is heated much faster than water. As the air above the land is heated, it rises high into the air, where it is then cooled. As it is cooled it starts to travel out above the ocean. As the cool air high in the atmosphere starts to fall or sink closer to the ocean surface, it pushes the warm air just above the surface of the ocean toward the land. The mass of air moving across earth’s surface is what we call wind.
 - b. Can you think of any ways in which we use wind?
 - c. Windmill
 - i. Wind power is not new. In fact wind power has been used for years in the form of a windmill. Show the picture of windmill. People used windmills to grind grain as far back as the ancient Romans, Persians, and Chinese. Wind power was also used during the Middle Ages in Europe to grind grain. Even in the early 1800’s people living on the Plains states used windmills to pump water from the aquifer.
 - d. Kites
 - i. Kites were first used in China, over 3000 years ago. Show the picture of kite. They were made from bamboo and silk. Benjamin Franklin used a kite to help discover atmospheric electricity.
 - e. Ships
 - i. Wind is and was important in sailing ships. Show the picture of ship. People like Columbus, the Pilgrims, or the Vikings would never have gone very far without wind-powered ships.
- V. All about Wind Power

So we have already seen how wind was important in the past, but what about the future? Could we use wind today?

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a. Originally we know that wind power was designed to pump water and turn machinery. It was also used to power radios and lights, but as power lines were developed windmills were no longer required to do these jobs. We can see the “remains” of windmills standing in forgotten in fields and pastures right here in West Texas. Today wind power is once again on the rise with the development of Wind turbines!

b. Wind Turbines

Wind turbines are windmills designed to optimize production of electricity. But don't just think of them as windmills, because they are far too large to call them that.

i. Size of wind turbines

I. In the early 1900's windmills were about 60 feet tall with a rotor that had about 20 blades. A rotor is the part that turns.

II. Today a wind turbine has only 3 blades, about 100 feet long, on the rotor. They stand as high as 400 feet tall!!!! Which is about as long as a football field.

The new rotors are aerodynamically designed to create lift instead of drag, allowing them to be much more efficient and create electricity.

c. How Wind Turbines Work

Each wind turbine has several parts that allow electricity to be created.

i. Rotor – is what catches or harvests the wind and turns the generator

ii. Nacelle – is like the control center/brain of the wind turbine

iii. Tower – is what supports the rotors and nacelle

iv. Transformer – is what converts the power to electricity

v. Foundation – is what supports the tower

d. Inside the Nacelle

Inside the nacelle are various parts that go into the production of electricity.

i. Rotor: gearbox, generator, yaw motor, anemometer, mechanical brake, main shaft, Yaw bearing, radiator, controller, wind vane, small shaft

e. How much power can a wind turbine produce?

i. We need to learn a few energy terms first. The first term we need to discuss is potential. What does the word potential mean? Potential has to do with how much energy could be produced.

If the wind is not blowing how much potential does the wind contain? When the wind is blowing 60 miles an hour, how much potential does the wind contain? Once the wind is actually blowing, it is no longer potential energy but kinetic energy

ii. Wind energy is produced by transforming kinetic energy into mechanical energy or electrical energy. The rotor's job is to catch the kinetic energy.

I. Kinetic energy is energy associated with motion

II. Electrical energy is energy involving electricity

iii. Electric production and consumption are usually measured in watts. A watt is very small so electricity is usually described in MWS and GWS.

I. Megawatts, MW, 1 million watts

II. Gigawatts, GW, 1 billion watts

iv. The amount of energy a turbine can produce, output, depends on its size, and the speed of the wind through the rotor. So the bigger the turbine and the faster the wind, the more electricity that can be produced.

v. A single turbine can produce between 500 and 1500 kW of electricity when it is spinning in a good windstorm. That is enough electricity for 250 to 750 homes a year. Wind Farms are areas where turbines are grouped from 10's to 100's. A wind farm produces electricity that goes directly into the utility grid, where it can be used immediately. So if one turbine can produce enough electricity for an average of 500 homes, then 100 turbines can produce enough electricity to power 50,000 homes.

VI. Why should we use wind power for electricity

- a. Most of American electricity comes from burning our natural resources such as coal and natural gas. These types of natural resources are non-renewable. Some electricity is produced by nuclear reactions. Producing electricity in this way also causes many types of pollution: Mercury pollution, acid deposition, and causes greenhouse gas emission.
- b. Wind power is not harmful to the environment.
 - i. Wind power is an inexhaustible form of energy. Wind power produces no emissions or pollutants, and turbines are very quiet.
 - ii. Wind power is very competitive.
 - iii. Wind power provides an open space. Wind turbines occupy 5% of the area where they are established. The remaining land can be used for farming, ranching, and wildlife.
 - iv. Wind power provides jobs. Wind power requires highly educated workers.
- c. Wind power is currently the fastest growing source of electricity in the world.

VII. Can we use wind power in Lubbock????

- a. Texas is listed as the #1 state for wind energy potential.
- b. But, the wind doesn't always blow!!!!
 - i. Utility companies must maintain enough power to supply their customers.
 - ii. Wind power can be used to supplement current energy needs. As the power is produced it can be immediately transferred where it is needed.
- c. Wind energy could supply 20 of the nations electricity according to Battelle Pacific Northwest Laboratory.

VIII. Activity

Make your own windsock:

- a. Pass out 1 piece of legal size paper per student
- b. Fold paper in half, like a hotdog, and draw a picture on one side
- c. Pass out 4 newspaper strips per student
- d. Glue the strips to the inside of the folded paper, so that they hang off of the long side
- e. Glue both sides of the paper together
- f. Make paper into a circle and glue the edges together
 - i. The newspaper strips should hang down
- g. Punch 3 holes, equidistant from each other in the top of the paper
- h. Pass out three strings to each student
- i. Tie one string into each hole and then tie all strings together

IX. Conclusion

Wind power is a safe, inexhaustible, and up and coming form of electricity. Wind farms have a very low impact on the environment, and the new technology is making wind power a very inexpensive form of energy. Wind power is good for you and good for me, shouldn't we all have wind farms and plant more trees?

Notes: use 4 strips per student. One legal size paper per student. 4 strings per student.

































