

Wind Power

Subject Area: Natural Resources

Unit Title: Renewable Energy

Grade Level: 4th & 5th grade

Objectives: To help students understand the limited and unlimited nature of various energy sources.

Colorado Content Standards to be covered:

SCIENCE

Standard I - Students understand the processes of scientific investigation, and design, conduct, communicate about, and evaluate such investigations.

Standard II - Physical Science: Students know and understand common properties, forms, and changes in matter and energy.

Standard IV - Earth and Space Science: Students know and understand the processes and interactions of earth's systems and the structure and dynamics of earth and other objects in space.

Standard V - Students know and understand interrelationships among science, technology, and human activity and how they can affect the world.

Anticipatory Set: Create a class "KWL" on the board by brainstorming with your students and having them fill in what they already know about wind power on a yellow sticky note (post these in the first column "K"). Do the same with what your students want to learn (middle column "W") and after the lesson have them fill out sticky notes to post in the last column with what they learned ("L").

Materials:

- sticky notes (or scraps of paper)
- stick pin
- square piece of paper
- pencil with eraser
- scissors

Input:

There is a kind of energy that can be used without using it up. It is called "renewable energy" because it can be "renewed" or replaced as we use it. Renewable energy comes from environmentally friendly resources that are naturally replaced by nature. Examples include solar energy, wind energy, geothermal energy and hydropower. Renewable energy is called "clean energy" or "green power" because it isn't produced by burning fuel.

This power is a powerful gift from nature. You can't see it, but you can see its effects. You can't touch it, but you can feel it. What is it? The wind! It's a source of incredible and inexhaustible power. For thousands of years, people have used the wind to grind their grain and water their livestock.

Wind continues to play an important role in our lives today. It is a very clean, safe, renewable source of energy. That's why wind is the fastest growing source of renewable energy in the world today!

In the beginning ...

Did you know that the first windmills were built in China and the Middle East around 200 B.C. to pump water and grind grain? In Europe, farmers in the Netherlands used windmills to drain water from farmland so they could plant more crops. In the 1600s, the Dutch began to reclaim land that was underwater by using windmills. Ancient sailors also depended on wind to take their ships from port to port.

Today, big “wind farms” with lots of tall turbines are built to generate energy to light homes and businesses, to run air conditioners, toast bread and open garage doors. Big, modern turbines that stand over 200 feet tall and have blades nearly 100 feet long generate 10 times the energy of the old-fashioned farmers' windmills. Blades are placed on towers because wind blows harder and more steadily high above the ground.

How do wind turbines work?

A wind turbine works the opposite of a fan. Instead of using electricity to make wind, a turbine uses wind to make electricity. When the wind turns the blades of a windmill, it spins the rotor that drives a shaft inside a small generator to produce electricity. The electricity is sent through transmission lines to a substation, then on to homes, businesses and schools.

The amount of electricity that a turbine can produce depends on the strength of the wind and the size of the blades.

Wind energy uses very little fuel and produces no pollution; but, because wind varies from place to place and season to season, wind farm developers must choose their site carefully. Generally speaking, the wind blows strongest on the tops of smooth hills, on shorelines, in mountain passes, on open plains and desert plateaus. Sometimes the wind doesn't blow at all, so electric companies must also operate back-up power plants so electricity is available around the clock, every day of the year. Electricity can't be saved and used later, so generators must be running all the time, to make light and heat always available.

Why is wind energy important?

There are many people who look for sources of clean energy, and wind energy is one of those sources. By the year 2020, the Department of Energy has announced a goal of obtaining 5 percent of U.S. electricity from wind.

Checking for Understanding: At the end, of this section choose one of the following for a quick check: ask the students to partner share and think, pair and share, do a quick 3 word write up as an exit slip, do a quick sketch or give each other a quick thumbs up or down to check for understanding. Determine the level of mastery for each student and provide individual remediation as needed.

Procedures/Activities:**MAKE YOUR OWN PINWHEEL WIND COLLECTOR.**

1. Lay the square paper flat on a table and draw a line across the middle from one corner to another.
2. Where these two lines cross, punch a hole with the pin.
3. Next cut the lines. Stop cutting when you get one inch from the hole.
4. Take the pin and punch a hole at the top left corner of each of the four flaps.
5. Pick up a flap at a punched corner and carefully curve it over toward the center hole. Secure it with the pin.
6. When all four flaps are held by the pin through the center hole, carefully push the pin into the pencil eraser.

FUN FACTS ABOUT WIND

- Wind is actually a form of solar (sun) energy. The sun, shining on the Earth and heating the atmosphere, generates wind.
- The first wind turbine designed to produce electricity was built in Denmark in the 1890s.
- Wind energy is a pollution solution. Using 100 kilowatt-hours of wind-generated electricity instead of electricity generated by coal, is equal to planting a half acre of trees, or not driving your car 2,400 miles.
- Wind farms now power the equivalent of 7.5 million average American homes.
- As public demand for clean energy grows, and as the cost of producing energy from the wind continues to decline, it is likely that wind energy will provide a growing portion of the nation's energy supply.

Closure:

Review and clarify the key points of the lesson by having students fill out a sticky note with what they learned to be posted in the “L” column on the “KWL” chart on the board.

| K (Know) | W (Want to Learn) | L (Learned) |
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