Wind Turbines

Earth & Space Science | Lesson Guide

3rd Grade

Photo Description

This image shows several large wind turbines in a flat, open field with clear blue sky. Wind turbines are tall structures with three long blades that spin around to catch the wind. The turbines are connected to power lines that carry energy, and you can see the wind moving the blades across the landscape.

Scientific Phenomena

Anchoring Phenomenon: Wind turbines demonstrate how moving air (wind) from Earth's atmosphere can be harnessed as a natural resource to produce energy.

Why it's happening: Wind is created by uneven heating of Earth's surface by the sun. Some areas get hotter than others, causing air to move from cool areas to warm areas. This moving air is wind. Wind turbines capture this moving air with their spinning blades, converting the kinetic energy of wind into electrical energy that people can use. This represents how Earth's natural systems (the atmosphere and weather patterns) can be used as renewable energy sources.

Core Science Concepts

- Weather and Wind: Wind is moving air caused by the sun heating Earth's surface unevenly. Different regions experience different wind patterns based on their geography and climate.

- Natural Resources: Wind is a natural resource that comes from Earth's atmosphere. Unlike fossil fuels that run out, wind is renewable because the sun will continue to create wind patterns.

- Energy Transformation: Wind turbines transform one form of energy (wind/kinetic energy) into another form (electrical energy) that people can use in their homes and communities.

- Landforms and Wind Patterns: The flat, open landscape shown in this image is ideal for wind turbines because wind moves freely across flat terrain without obstruction from hills or trees.

Pedagogical Tip:

When teaching about wind turbines to Third Graders, anchor the lesson in their direct experience: Have students go outside on a windy day and feel the wind push against them, or observe leaves and grass moving. This concrete experience helps them understand that wind is real, invisible moving air—not just a concept in a textbook. Then connect this to how turbines use that same wind energy.

UDL Suggestions:

To support diverse learners: (1) Representation: Provide both visual images of wind turbines and tactile demonstrations (paper windmills, fans) so students can see AND feel how wind causes movement. (2) Action & Expression: Allow students to demonstrate understanding through multiple modalities—drawing wind patterns, building a model turbine, or explaining to a partner. (3) Engagement: Connect wind turbines to students' lives by discussing how the electricity from wind turbines powers their homes, schools, and favorite devices.

Zoom In / Zoom Out

Zoom In: Molecular Movement
At a microscopic level invisible to our eyes, wind is made of billions of air molecules moving very fast in the same direction. Each molecule bouncing and pushing on the turbine blades is too tiny to see, but together, all those molecules create enough force to make the huge blades spin. Temperature differences at the molecular level (some air molecules moving faster than others) is what creates wind in the first place.

Zoom Out: Earth's Climate and Energy Systems
Zooming out to the whole planet, wind turbines are part of Earth's larger energy and climate system. The sun heats Earth unevenly because of the planet's tilt and rotation, creating global wind patterns (like trade winds and jet streams). These planetary wind patterns are predictable and used by scientists to plan where to place wind farms. Wind turbines help reduce the burning of fossil fuels, which affects Earth's atmosphere, weather patterns, and climate over time.

Discussion Questions

1. "How do you think the wind helps the turbine blades spin, and where does that spinning motion go?" (Bloom's: Analyze | DOK: 2)

2. "Why do you think people built these wind turbines in this flat, open field instead of in a forest or a city with lots of tall buildings?" (Bloom's: Analyze | DOK: 3)

3. "If the sun stopped shining on Earth, what would happen to the wind and the wind turbines?" (Bloom's: Evaluate | DOK: 3)

4. "What do you think happens to the electricity made by wind turbines? Where does it go after it's created?" (Bloom's: Create | DOK: 2)

Potential Student Misconceptions

Misconception 1: "The blades push the wind to make electricity."
- Clarification: The wind pushes the blades to make them spin. The spinning blades are connected to a generator that creates electricity. The wind does the work; the turbine just captures that energy.

Misconception 2: "Wind turbines only work on windy days and won't work when it's calm."
- Clarification: You're right that turbines need wind to work! Turbines are placed in locations where the wind blows regularly and reliably. Scientists study wind patterns in different places to find the best spots for wind farms.

Misconception 3: "The turbines create wind."
- Clarification: Turbines don't create wind—they use wind that already exists. Wind is created by the sun heating Earth's surface. Turbines just capture that moving air energy and change it into electricity.

Extension Activities

Activity 1: Paper Pinwheel Wind Catchers
Students construct simple paper pinwheels (or paper windmills) and test them indoors with a fan or outdoors on a windy day. They observe how wind speed affects the spinning speed and record their observations. This concrete, hands-on activity helps them physically experience the concept that moving air creates rotation—just like in real turbines. Students can decorate their pinwheels and predict where in the schoolyard wind would be strongest.

Activity 2: Wind Data Collection and Graphing
Over a week or two, students observe and record wind conditions at the same time each day (windy, moderate wind, calm) and create a simple bar graph or table to show the data. They can discuss patterns: Was it windier on certain days? Did weather change affect wind? This connects to seasonal weather patterns and helps students see that wind varies predictably over time—important for understanding why wind farms are placed in consistently windy areas.

Activity 3: Design a Wind Turbine Blade
Using craft materials (straws, paper, foam, tape), students design and build their own small turbine blades. They test their designs by holding them in front of a fan or blowing on them to see which blade shape spins best. Students document what they notice about blade angle, size, and shape. This engineering activity reinforces how structure relates to function and connects to real turbine engineering.

Cross-Curricular Ideas

Math: Have students measure and compare the heights of the turbines in the photo using a scale ruler or estimation. Create bar graphs showing wind turbine heights compared to familiar objects (school buildings, trees). Calculate how many homes one turbine might power based on simple multiplication and division problems.

ELA: Read and discuss informational texts or picture books about renewable energy and wind power. Students can write descriptive paragraphs about what they see in the image, write a poem about wind, or create a comic strip showing how wind becomes electricity. Practice sequencing by explaining the steps of how a wind turbine works.

Social Studies: Discuss where wind turbines are located (geography, climate zones) and why communities choose renewable energy. Explore how wind turbines affect the local landscape and communities where they're built. Research which states or regions have the most wind turbines and why.

Art: Create mixed-media artwork showing wind turbines in different seasons or landscapes. Draw or paint the motion of spinning blades using lines and colors. Sculpt turbines from clay, modeling compound, or recycled materials. Illustrate the invisible concept of wind using visual symbols and colors.

STEM Career Connection

1. Wind Energy Technician
A wind energy technician is someone who builds, maintains, and repairs wind turbines. They climb up inside the tall turbines to fix broken parts, check the blades, and make sure everything works smoothly. It's like being a doctor for wind turbines! They help keep turbines spinning safely so communities have clean electricity.
Average Annual Salary: $56,000 USD

2. Wind Farm Engineer
A wind farm engineer decides where to build wind turbines and how to design them to work best in different places. They study wind patterns, weather, and the landscape to figure out the best locations. They also design the turbines themselves to be safe, strong, and efficient at catching wind energy.
Average Annual Salary: $98,000 USD

3. Meteorologist (Weather Scientist)
A meteorologist studies weather and climate patterns, including wind. They use special tools and computers to predict where the wind will blow and how strong it will be. This information helps people decide where to build wind farms and predict how much electricity they can make.
Average Annual Salary: $97,000 USD

NGSS Connections

3-ESS3-1: Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.
- Context: Wind turbines can be designed or positioned to withstand extreme winds and other weather events. Students can explore how the height, blade design, and location of turbines help them function safely in different climates.
- 3-ESS3.B Engineering design can be used to reduce the impacts of natural Earth processes on humans.
- Systems and System Models
- Structure and Function

3-ESS2-2: Obtain and combine information to describe climates in different regions of the world.
- Context: Different regions have different wind patterns and climates, which determines where wind turbines are most effective. Students can research and compare wind conditions in different areas.
- 3-ESS2.D Climate describes the range of an area's typical weather conditions and the extent to which its conditions vary from year to year.
- Patterns

3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.
- Context: Wind patterns often change with seasons. Students can collect and display data about wind speed and direction across different seasons to understand how weather conditions affect turbine productivity.
- 3-ESS2.A Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular place at a particular time.
- Patterns

Science Vocabulary

* Wind: Moving air caused by the sun heating Earth unevenly, making some air warmer and lighter than other air.

* Turbine: A machine with blades that spin when wind or water pushes them, used to create electricity.

* Renewable Resource: A natural resource that will not run out because nature keeps making more of it, like wind and sunlight.

* Energy: The ability to make things move, heat up, light up, or change in other ways.

* Atmosphere: The invisible blanket of air surrounding Earth that we breathe and where weather happens.

* Climate: The typical weather patterns a place has over many years, including temperature, wind, and rainfall.

External Resources

Children's Books:

- Wind Energy: Harnessing the Power of the Wind by Rebecca Olien (part of the renewable energy series for elementary students)

- The Magic School Bus Goes Green: A Book About Energy by Joanna Cole and Bruce Degen (features Ms. Frizzle exploring renewable energy sources including wind)

- What is Energy? by Maria Bahrampour and illustrator Erica de Chavez (explains different types of energy, including wind energy, in accessible language for early readers)