



WIND POWER

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How It Works

- How does wind produce energy?
- How is this energy transformed into usable energy?
- How does a wind turbine work?

Economic Aspects

- What are the costs?
- List and describe the advantages of using wind energy to produce electricity.
- List the disadvantages of using wind energy to produce electricity.

Types of Energy

- What is renewable and non-renewable energy?
- Why is wind considered a renewable and clean energy source?

Usage and Impact

- Where is this source of energy commonly used?
- What are the locations of some wind farms in the US?
- How does using this type of energy affect the environment?

Additional Resources

- [Video: How Do Wind Turbines Work?](#)

Answer Key

How It Works

How does wind produce energy?

Wind produces energy through its kinetic energy - the energy of motion carried by moving air.

How is this energy transformed into usable energy?

Wind turbines convert wind's kinetic energy into electricity using aerodynamic force from the rotor blades.

How does a wind turbine work?

When wind flows across the turbine blades, it creates a difference in air pressure, causing the rotor to spin. This rotation is transferred to a generator, either directly or through a gearbox, which produces electricity.

Types of Energy

What is renewable and non-renewable energy?

Renewable energy comes from sources that naturally replenish on a human timescale (e.g., wind). Non-renewable energy comes from finite sources that will eventually run out (e.g., fossil fuels).

Why is wind considered a renewable and clean energy source?

Wind is renewable because it's naturally replenished. It's clean because wind turbines don't release emissions that can pollute the air or water during operation.

Economic Aspects

What are the costs?

Costs include initial turbine manufacturing and installation, as well as ongoing maintenance and operation. However, wind has no fuel costs.

List and describe the advantages to using wind energy to produce electricity.

- Emissions-free energy source*
- No water required for cooling*
- Small physical footprint for individual turbines*
- Can reduce electricity generation from fossil fuels*

List the disadvantages to using wind energy to produce electricity.

- *Visual impact on landscapes*
- *Potential noise from turbine blades*
- *Rare instances of turbine fires or lubricant leaks*
- *Possible harm to birds and bats*
- *Service roads may be required for land-based projects*

Usage and Impact

Where is this source of energy commonly used?

Wind energy is used on open land, mountain ridges, and offshore in lakes or oceans.

What are the locations of some wind farms in the United States?

Wind farms in the United States are located in various regions, with many concentrated in certain areas:

1. Great Plains: Many of the large wind farms in the U.S. are situated in this region.
2. Upstate New York: Most of New York's onshore wind power is located in this area.
3. Offshore East Coast: Several offshore wind projects are in development along the East Coast, particularly off the coast of New York and other northeastern states.

How does using this type of energy affect the environment?

Wind energy has fewer environmental effects than many other energy sources. It doesn't produce air or water pollution during operation. However, it can have some effects on wildlife and landscapes, which are studied and mitigated.