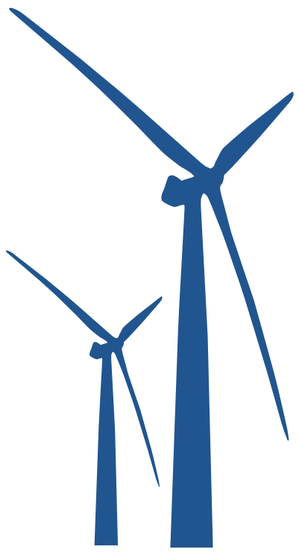
Wind Energy

What Is It?

Energy is generated when natural winds generated by temperature differences and air pressure cause wind to blow past turbines and rotate rotors.



How Clean Is It?

Wind energy does not produce any emissions from its generation. However, the manufacturing process for building wind turbines does entail a significant amount of carbon emissions and retired blades are difficult to recycle and often end up in landfills.

What Does It Cost?

Wind turbines cost around $1 million per Megawatt. Electricity from wind power can cost as low as 2 cents per kWh. New transmission infrastructure and project remoteness may affect costs and are built into electricity rates.

Space

A single wind turbine takes up minimal space, but necessary distancing between turbines and the open spaces needed means that wind turbines take up around 70 acres per MW, more than almost any other energy resource.

Point — Counterpoint

Point		Counterpoint
• Wind energy has one of the lowest fatality rates of any energy source.	⟷	○ Maintenance workers must ascend 280-foot tall turbines for yearly inspections.
• Wind turbines are front-loaded for carbon intensity and can eventually negate their carbon footprint.	⟷	○ Mining, transporting, and manufacturing turbines is highly carbon intensive. Turbines must be replaced after approximately 20 to 25 years.
• Wind turbines allow for multi-purpose surrounding land use due to the small area turbines occupy.	⟷	○ Turbines need to spaced out in order to account for turbulence generated from other turbines. This can diminish effective land uses and disrupt natural aesthetics.
• Wind energy is generally the lowest cost energy source on the market.	⟷	○ The inconsistency of wind power can lead to price fluctuations and lack of energy security.
• Wind energy reduces net emissions to mitigate potential impacts to climate and public health.	⟷	○ Wind turbines often generate noise pollution and can kill endangered species, such as slow-reproducing large birds.

How Does It Work?

1. Uneven heating of the Earth's surface by the sun and changes in geography produce differential air pressure. Warm and colder air moving in relation to one another creates wind.

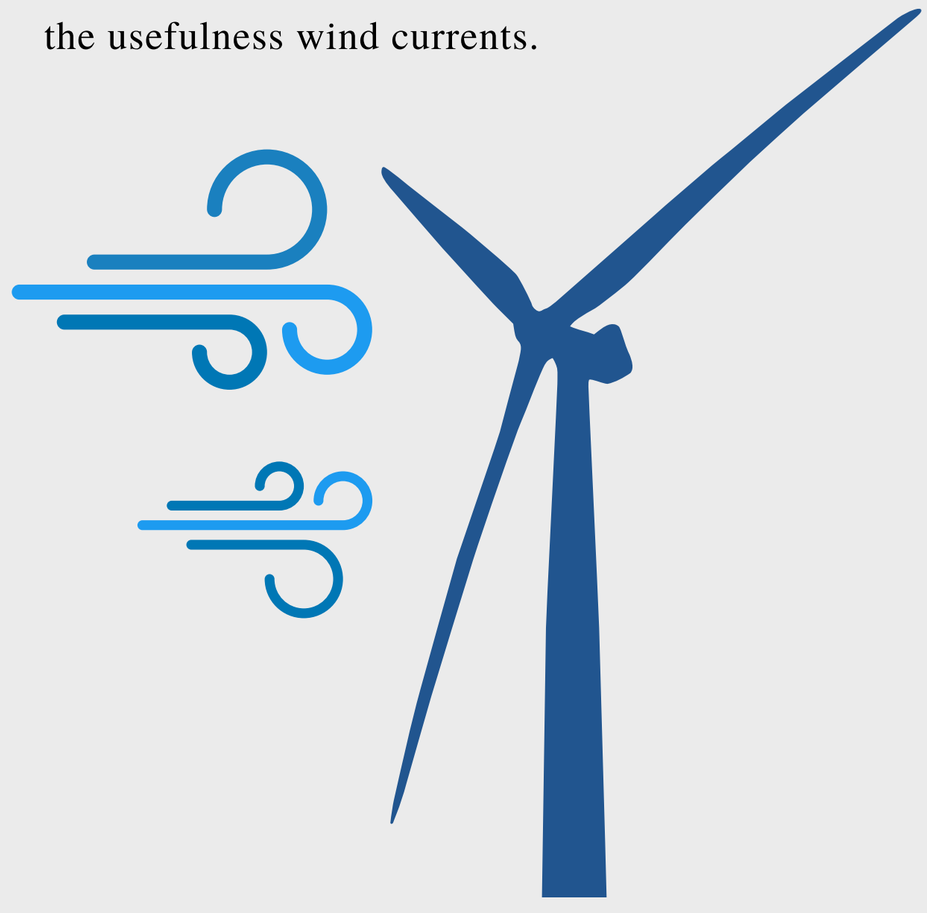
2. Wind is used to push the blades of a turbine, which extend as far as 290 feet.

3. The kinetic energy of wind is transferred into a turbine, which is applied to a rotor.

4. The rotor spins a generator, creating electricity.

5. The generator is connected to the power grid to transmit and distribute electricity.

6. Multiple wind turbines can be placed on land or water in a "wind farm" to maximize the usefulness wind currents.



Did You Know?

Humans have been using windmills for millennia. The first windmills were developed in China and Persia in 200 B.C.

What's Next?

Offshore wind turbines have the capability to produce far more power than onshore turbines, but offshore wind projects in the U.S. have been delayed by slow permitting processes. Both onshore and offshore wind energy is expected to grow significantly over the next decade.