



STEM KIT

BUILD & LEARN
GUIDE

WIND TURBINE



SUSTAINABLE
MATERIAL



NO GLUE
OR MESS



SAFE AND
EASY USE



PROJECT OVERVIEW

This project will focus on wind energy. Wind energy is renewable energy, meaning its supply can be replenished faster than it is used. Students will be able to build their own wind turbine and power a small LED light. Wind power uses kinetic energy from the wind's motion to generate electricity. Wind turbines generate electricity, while windmills generate energy to perform a specific action, such as pumping water or grinding grain. As the blades of the wind turbine spin, the rotor is attached to a generator that then creates electricity. There are two main types of wind turbines, horizontal-axis wind turbines (HAWTs) and vertical-axis wind turbines (VAWTs). HAWTs are the most common form of wind turbine in the U.S.

SAFETY WARNINGS:

Please read all safety warnings before use:

Choking Hazard: Small parts not for children under 6 years or any individual who have a tendency to place inedible objects in their mouths.

Keeps hands and fingers away from blades

Adult supervision required.

MATERIALS

Durable wooden construction pieces

Turbine Hub

Generator Motor

LED

Zipties

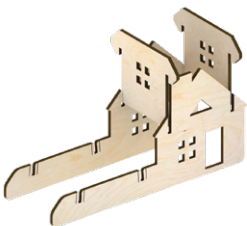


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Note: If you can not break out a piece(s) by hand, use a small tool or screwdriver to punch and press them out. If you have no experience with tools, get help from an adult or someone with experience. If there are any burrs, points or rough spots do to breaking or cutting, smooth them with a piece of sand paper.

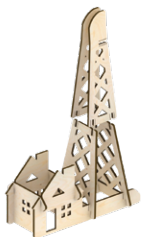
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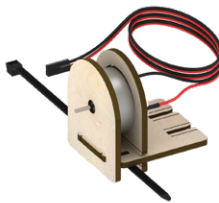
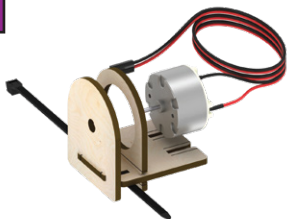
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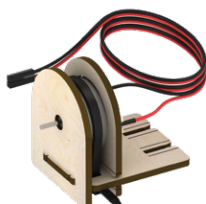
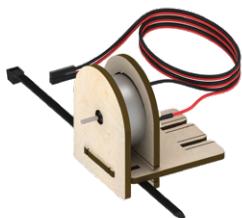
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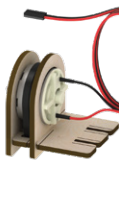
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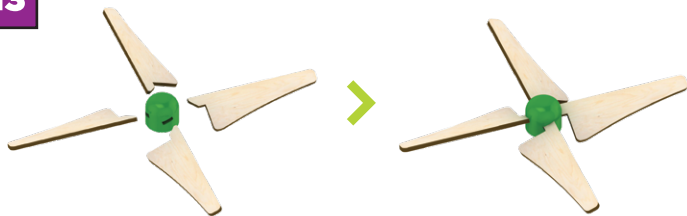
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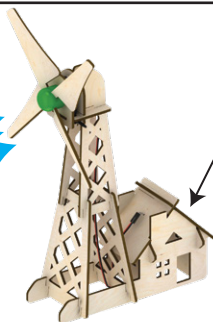


HOW TO USE

FAN REQUIRED*



*Fan not included with STEM Kit



LED will light up when the turbine spins at the proper speed/s.

Set Up the Fan: Testing of the BrainStorm Wind Turbine STEM Kit requires the use of a medium to high-powered fan in order for the generator motor to produce enough voltage to illuminate the LED light inside the house.

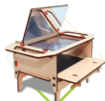
If you enjoyed this STEM Kit, check out some of our other Kits!



CIRCUIT
SWORD



AIR-POWERED
ROCKET



SOLAR
OVEN



AND
MORE!

TERMINOLOGY

Kinetic energy - energy something has as it is in motion.

Potential energy - energy that is stored in an object due to where it is in relation to other objects.

Wind energy - energy generated through harnessing the power of the wind.

Climate change - the change to an area's weather and temperature, over a period of time

Emissions - greenhouse gases released into the atmosphere, or a specific area, over a period of time.

Wind turbine - a machine, powered by wind, that generates electricity

Renewable energy - all energy that comes from a source that can be generated faster than it is consumed.

Nonrenewable energy - all energy that comes from a source that will one day be depleted.

Sustainability - meeting the needs of the current population without putting future populations at risk.

Wind vane - also referred to as a weather vane, this instrument shows which direction the wind is flowing.

Windsock - textile "sock" which is used to measure wind speed and direction.

Atmospheric pressure - the air pressure within Earth's atmosphere.

Rotor - a part that rotates in a stationary machine.

LED - light emitting diode; semiconductor diode that produces light when given a power source.

ENERGY & SUSTAINABILITY

RENEWABLE ENERGY

Renewable energy often referred to as “clean energy” is any form of energy that comes from a source that can be replenished faster than it is used. There are several types of renewable energy, these include wind, solar, geothermal, biomass, tidal and hydroelectric. Renewable energy has lower emissions than nonrenewable energy. Emissions are greenhouse gases that are released into the atmosphere, or specific area, over some time.

NONRENEWABLE ENERGY

Nonrenewable energy often referred to as “dirty energy” is any form of energy that comes from a source that will eventually be depleted. Nonrenewable energy produces more emissions and contributes to climate change. There are several sources of nonrenewable energy, these include coal, natural gas, oil, and nuclear power. Coal, natural gas, and oil are often referred to as fossil fuels. Fossil fuels are sources of energy that are composed of dead plants and animals that, with the help of heat and pressure, have fermented, for millions of years, below the Earth’s surface. The use of these types of energy sources is substantially contributing to climate change, regionally and globally.

SUSTAINABILITY

Sustainability consists of meeting society’s needs without causing future generations to be unable to meet their needs. Sustainability always considers three things: the environment, the economy, and society. Sustainable practices are those which focus on the value of the physical environment and use it wisely. Choosing to be sustainable may be impacted by community, personal beliefs and morals, and cultural practices.



WHAT IS WIND?

Wind is the movement of air. Wind is caused by three main things:

1. The uneven heating of Earth's surface.
2. Differences along the surface of the Earth.
3. The Earth's rotation.

Air contains an enormous amount of particles, such as nitrogen and oxygen, that have weight. The weight of these particles pushing down on Earth's surface causes atmospheric pressure. These particles react to how hot or cold the air becomes. When heated, particles will move away from the Earth's surface and spread out, causing lower pressure. When cooled, they will fall closer to Earth's surface and compress, creating higher pressure. The movement of these particles in the atmosphere causes wind.

Wind transports heat, dust, moisture, and pollutants over considerable distances. Wind is specified by its speed and direction. Wind speed is determined by differences in air pressure:

Slow Wind = High Air Pressure

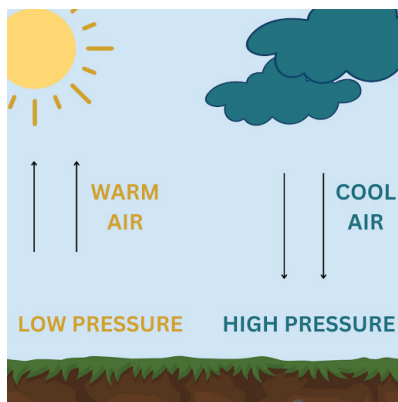
Fast Wind = Low Air Pressure



Wind sock - basic tool for measuring wind speed and direction

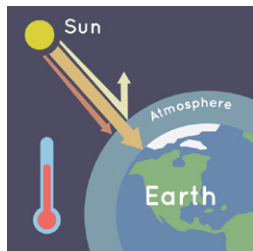


Anemometer - tool used to measure wind speed and direction



GREENHOUSE GASES, HUMIDITY AND BAKING

GREENHOUSE GASES are what cause the greenhouse effect, which is the warming of Earth's surface and surrounding air. This effect happens because sunlight enters Earth's atmosphere, getting converted to heat, and becoming trapped in the atmosphere. The greenhouse effect is one of the things that makes Earth a comfortable place to live. The most common greenhouse gases are water vapor, carbon dioxide, and methane. A box solar oven acts like sunlight entering our atmosphere. As the sunlight goes through the glazing on the box oven, it heats the air inside and is trapped there, just like the greenhouse effect.

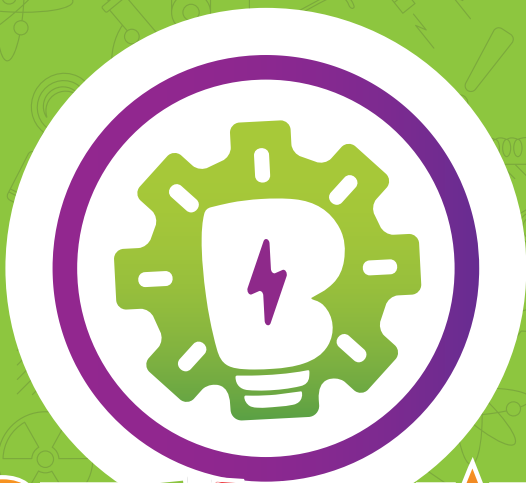


HUMIDITY AND BAKING

Humidity is the amount of water vapor in the air. Water vapor is water in its gas state. When the temperature of the air increases, the humidity can increase. This increase can happen because of

the molecule movement in the air. Water molecules can conduct heat much faster than air, making it have an intense effect on baking. Too much, or too little, humidity when baking can lead to problems with the baking. Humidity has such an important effect on baking that it's advised not to bake on hot and humid days, or rainy days.





STEM KIT

WIND TURBINE BUILD & LEARN BOOKLET

For more information on our STEM Kits visit:

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 **STEM EDUCATION**

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