Central High School Wind Energy Advisor: Ms. Casanova

In the following slides you will find how we learned about our renewable resource we call wind. We learned this through using NEED resources and activities!

Steps to get there:

1. **Reading using Anchor strategies to pull out vocabulary.**
2. **Hand on investigations around how wind does work and electricity.**
3. **Researching renewable resources, the conservation of energy.**
4. **Concentrating specifically around wind energy.**
5. **Building a wind turbine and testing it with a multimeter.**
6. **Speaking to my model.**

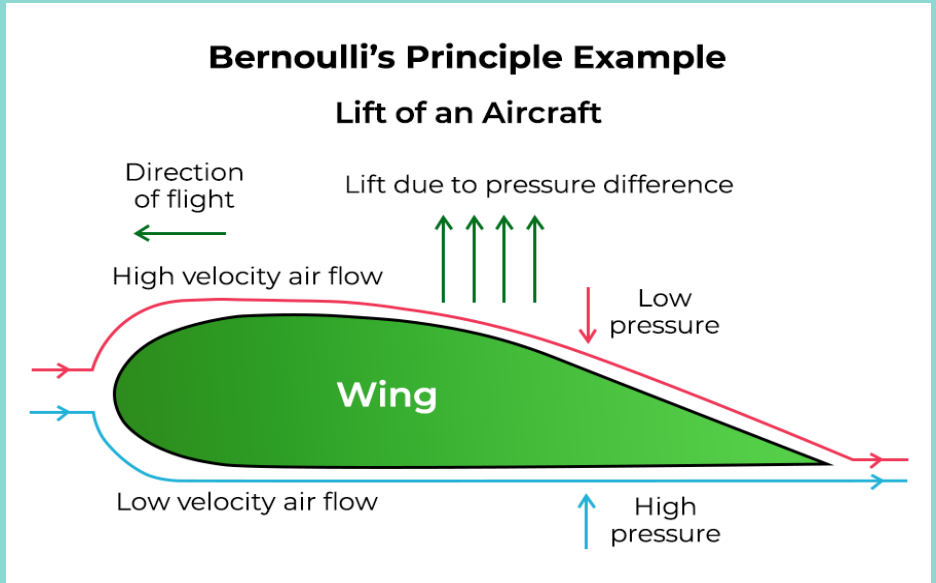
Our goal was to learn and apply new vocabulary and science concepts to real world problems.

Key Vocabulary:

1. **Wind Energy:** The process by which the wind is used to generate chemical power or electricity.
2. **Thermal Energy:** Or heat energy is produced when a rise in temperature causes atoms and molecules to move faster and collide with each other. The earth produces this from absorbing radiant energy.
3. **Radiant Energy:** The physical energy resulting from electromagnetic radiation, usually observed as it radiates from a source into the surrounding environment. Our primary source of energy is our sun. Our sun gives us radiant energy.
4. **Mechanical Energy:** It's the energy that is possessed by an object due to its motion or it's position.
5. **Electrical Energy:** It's a type of kinetic energy caused by moving electric charges.
6. **Conservation of Energy:** A principle stating that the energy cannot be created nor destroyed, but can be altered from one form to another.
7. **Albedo:** The proportion of radiant energy being reflected from a surface.
8. **Convection:** The transfer of heat by the movement of a fluid (liquid or gas) between areas of different temperature.
9. **Absorb:** **Take in**
10. **Reflect:** **Throwback heat, light, or sound without absorbing it.**

Bernoulli's Principle:

For example, if the air flowing past the top surface of an aircraft wing is moving faster than the air flowing past the button surface, then Bernoulli's principle implies that the pressure on the surfaces of the wing will be lower above than below. This pressure difference results in an upward lifting force.

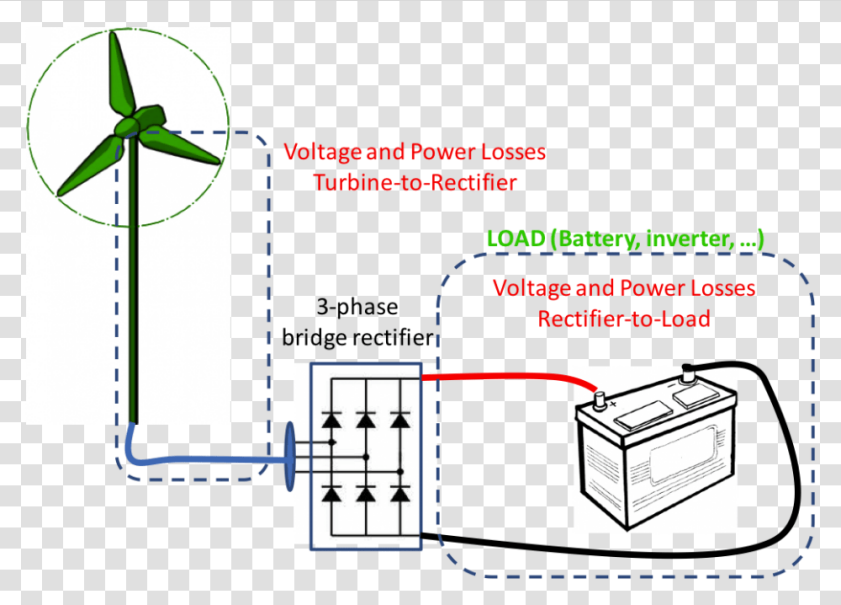


This is why we designed our wind turbine blades with round sides and flat sides.

Circuitry

An electric circuit is composed of individual electronic components, such as resistors, transistors, capacitors, Inductors and diodes connected by conductive wires through which electric current can flow.

We used circuitry in our turbines by using a generator that converts mechanical energy into electricity.



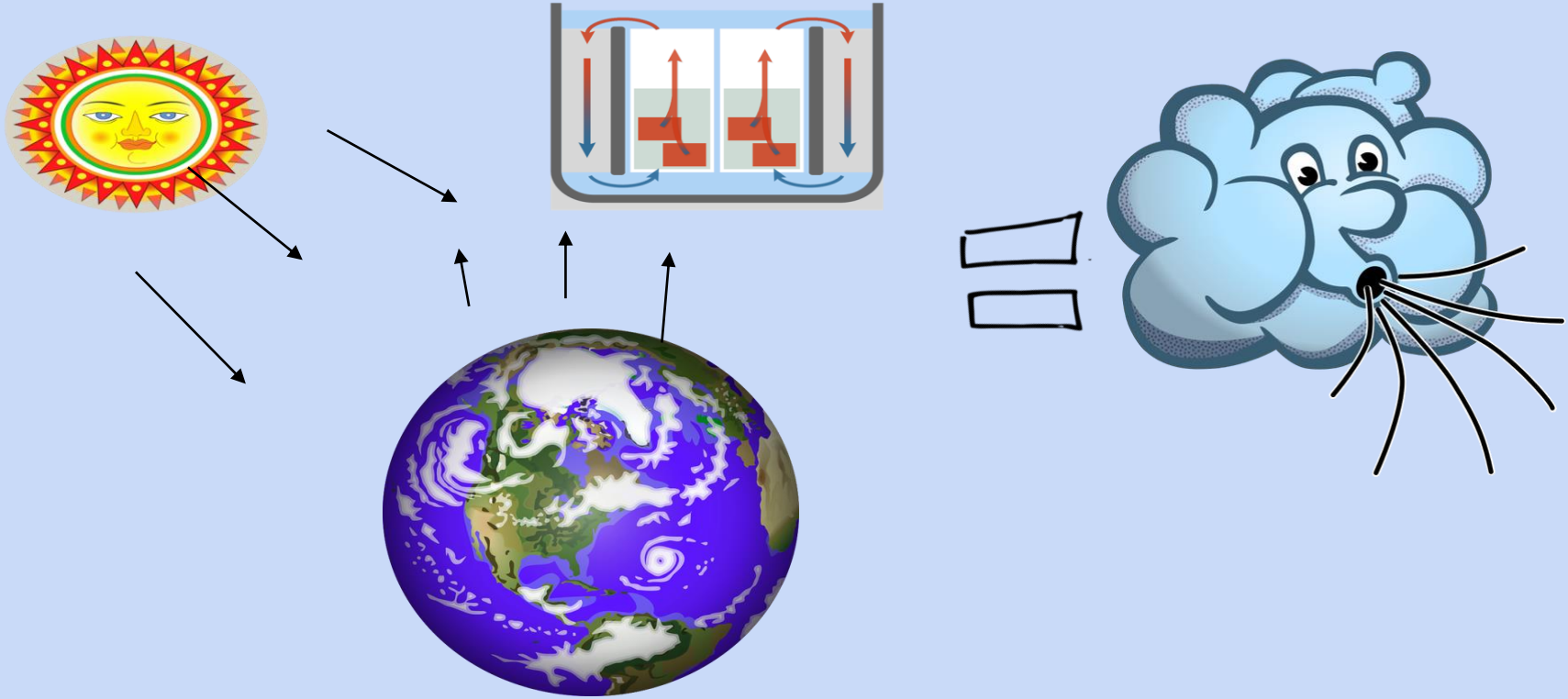
Our Primary Source of Energy:

As the kinetic mechanical energy of the moving wind rotates the blades of the wind turbine, a generator inside the turbine is also rotated. This causes a coiled wire to rotate around a magnet and creates an electrical current which we measure with a multimeter.

Wind is caused by differences in pressure created by the uneven heating of Earth's surface by the sun. Radiation from the sun causes land to gain thermal energy. The air above the land also gains thermal energy and expands, becoming less dense and rising.

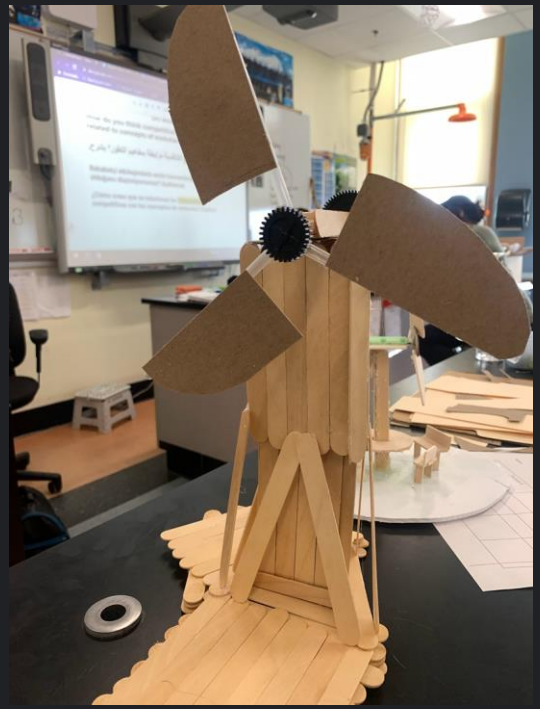
A wind turbine transforms the mechanical energy of wind into electrical energy. A turbine takes the kinetic energy of a moving fluid, air in this case, and converts it to a rotary motion. As wind moves past the blades of a wind turbine, it moves or rotates the blades. These blades turn a generator. A generator works as an inverse of an electric motor; instead of applying electrical energy to turn it and create mechanical energy, it uses mechanical energy to turn and create electrical energy. Generators spin coiled wire around magnets to create an electrical current.

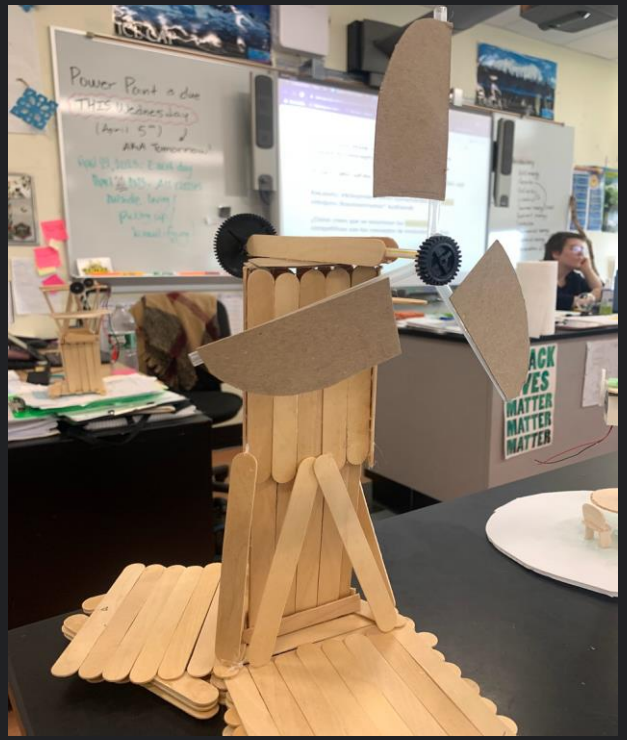
A picture to illustrate the conservation of energy.



Our Model Turbine:

- Popsicle sticks
- Plastic straws
- Paper cardboard
- Plastic wheels
- Generator





Engineering Design:

First we began with how wind can do work. Through this activity we understood the engineering of the axle mount and the axle.
From there we learned about circuits and electronics.
We investigated local wind turbines finding out that our average wind speed is about 15 mph. Also that our local wind turbines stand about 300 feet.
From this information, we scaled our turbines down from 300 feet.
we had problems with aligning the gears at first. By perseverance, we made them connect like clockwork.
After that we tested our model with a multimeter. We found that it was generating voltage, but knew it could generate more.
We then worked on designing blades with more mass and accuracy around placing them at 20 degrees with a pitch finder.
We tested our turbine again.
We couldn't believe it when we saw the multimeter reach 6.33 volts! Our goal was to be able to charge a cell phone. Through our research we found out that you need 5 volts. We did it!

Renewable Resources

Currently in the US:

Hydropower 2.83%

Wind 27.4%

Solar 0.79%

Geothermal 1.7%

Biomas 39.8%

Hydroelectric 18.8%

How has what I've learned influenced my understanding of renewable resources?

While constructing our wind turbine we experience not only constructive work but, our understanding of renewable resources has expanded. We know that designing a wind turbine and constructing it can be done. We do not need to use nonrenewable resources for electricity, we have a source that is naturally occuring. Our wind turbine generates electric currents. The air moves the blades, also making the motor run, and the generator that converts mechanical energy into electricity. This is how our wind turbine works, and how it is used as an example of a renewable resource.