



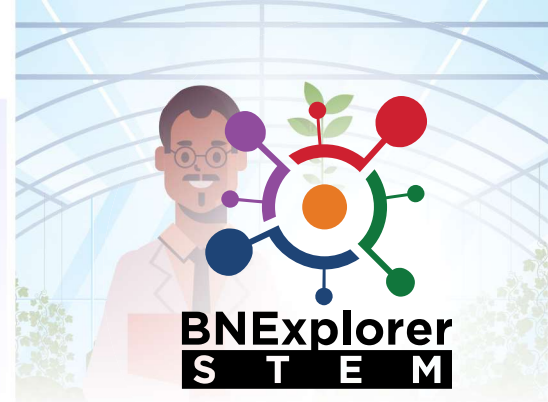
# BNExplorer S T E M

## MISSION RENEWABLE ENERGY



**Grades 5-8**





# SPARK



Before watching the video write down what you already know about non-renewable and renewable energy.

Next, please watch this video:  
<https://youtu.be/1kUE0BZtTRc>



Photo from the website:

<https://www.nrdc.org/stories/renewable-energy-clean-facts>

## IMAGINE

Before the activity of the experiment, let's think about our impact on climate change. Discuss with your parents what factors in YOUR life contribute to the negative impact of climate change. Now let's think about all the ways your community has contributed to the positive impact of controlling climate change.

In the world, fortunately in the town of Bloomington-Normal, wind energy is an example of renewable energy used to control climate change. Today, we will build a homemade wind turbine that shows how natural resources can make our Earth a little more green!

Let's watch this video to see the power of wind energy!

<https://youtu.be/vrN9QcJyCII>

How do you think the homemade wind turbine will show the power of renewable energy?

Write your hypothesis:

My hypothesis is \_\_\_\_\_

because \_\_\_\_\_





# CHALLENGE

This website ( <https://www.sustainablelearning.com/sites/default/files/a> ) shows an example experiment of creating a homemade wind turbine to demonstrate the power of wind energy as renewable energy.

## Materials Needed:

- A ruler
- 1 plastic bottle
- 1 wooden rod
- 1 drinking straw
- 1 pin
- A sharp pencil
- Cotton or string
- Sticky tape
- A piece of thick card
- Material to make your blade (Paper, Cardboard, etc.)



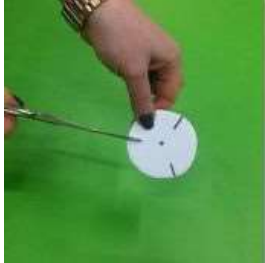
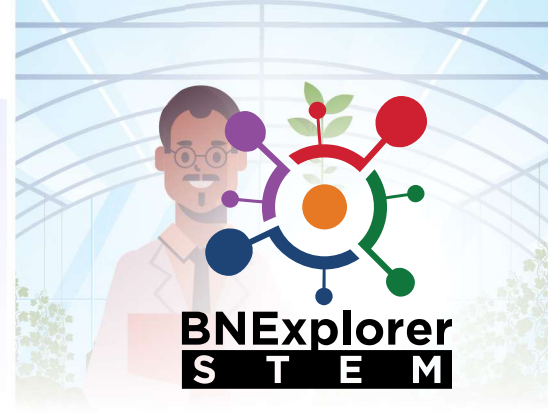
1. First, using the sharp pencil, poke a hole through both sides of the neck of the plastic bottle. (Going straight through the upper-part of the plastic bottle) The plastic bottle will be your wind turbine tower.



2. Next with the scissors, cut the straw so it is between 10 -15 cm in length. If you are using a bendy straw, cut the bendable part off and discard.



3. Push the straw through the hole in the bottle you created in the first step. Then push the wooden rod through the straw.



4. Now with the thick card, we are making a circle. Using a ruler measure out about 6 cm for the diameter of the circle. Make 3 cuts on the circle spread out for the wind turbine to attach to.



5. Following, the circle will be attached to the end (the tip) of the wooden rod with the pin. You can use tape to secure the circle to the rod. This will be the shaft of the wind turbine.



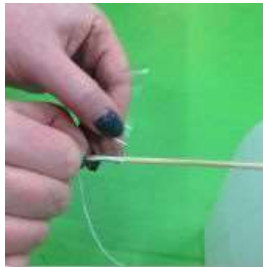
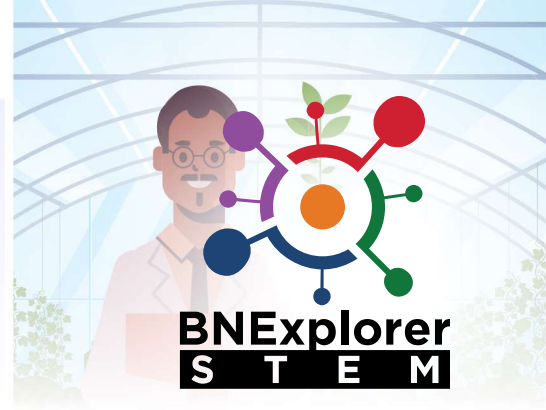
6. Taking the chosen material for the blades, draw and cut 3 long rectangles that are wide enough to bend in half easily. However the shape can be different rather than rectangles if you prefer, it's your choice!



7. At the end of the blade, cut a 1cm line in the middle for the 3 blades. (If you bent the material in half, this will be a guide on where to cut.) This will attach to the cut you made in the circle.



8. Now, slot all the blades through the cuts you made in the circle. You may need to use tape to hold it in place.



9. Measure a length of string of about 20 cm or longer, with one end of the string taped to the wooden rod on the opposite side of the circle and blades.



10. This is your final product! It should look something like this:

- Finally to demonstrate the power of the wind turbine with its movements, use a fan or hairdryer (as shown above in the left picture) to make the blades and shaft turn, winding up the string!
- What do you observe happening?
- How does this experiment show that wind is a renewable energy?

## CHALLENGE QUESTION

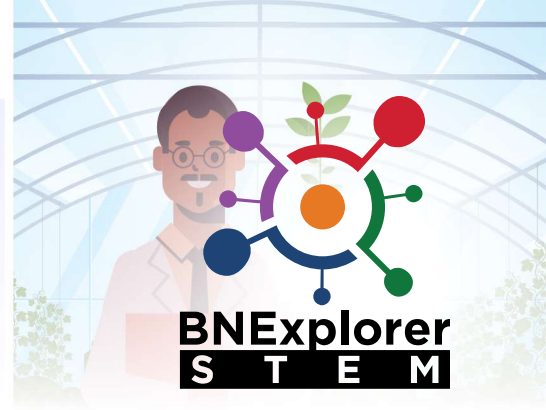
How is renewable energy influential in our world? How does renewable energy compare non-renewable energy? Specifically, how does wind energy play a part in renewable energy?

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# EXPLORE

If you want to see renewable energy in the real world, in Normal-Bloomington, IL, Twin Groves Wind Farm is a great place to check out!

<https://www.edpr.com/north-america/twin-groves-wind-farm>



Check Out Our Visit to Twin Groves Wind Farm!



# CAREERS

We talked with Angie Luginbuhl from Legacy Solar Systems about renewable energy.





## FUN FACT

– “In 2009, renewable sources accounted for about 10 percent of U.S. electricity generation.”

• From this website:

<https://www.aps.org/policy/reports/popa-reports/integelec-facts.cfm>

### WIND POWER:

– “Wind Turbines are big. Wind turbine blades average over 190 feet long, and turbine towers average 295 feet--about the height of the State of Liberty.”

– “Human civilization has harnessed wind power for thousands of years. Early forms of windmills used wind to crush grain or pump water. Now, modern turbines use wind to create electricity.”

• From this website:

<https://www.energy.gov/eere/wind/articles/top-10-things-you-didnt-know-about-wind-power>

## EXTEND YOUR KNOWLEDGE:

Wind is just one type of renewable energy. The sun is another resource that helps to provide renewable energy. In many developing countries solar cooking is a simple technology being used. Read the following article for more information:

<http://www.its.caltech.edu/~e105/readings/solarcookers.pdf>





If interested try making your own solar cooker.

#### Materials needed:

- cardboard box with attached lid, at least three inches deep
- heavy-duty aluminum foil
- clear plastic wrap
- glue stick
- utility knife
- tape
- ruler
- pencil or marker

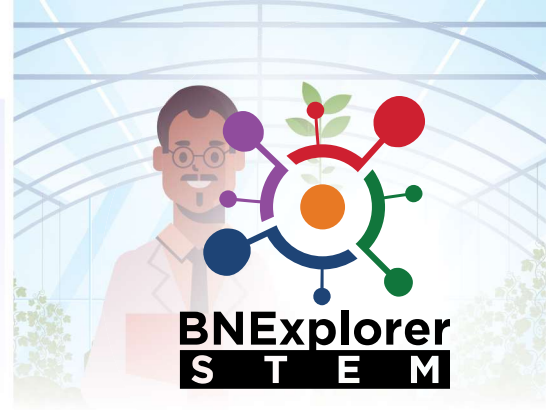
<https://www.hgtv.com/design/make-and-celebrate/handmade/how-to-make-a-solar-oven>



1. Mark a one-inch border around three sides of the top of the box. Use the utility knife to cut out the flap.
2. Spread a coat of glue on the inside (bottom) of the flap, then cover with aluminum foil. Line the inside of the box with aluminum foil, gluing it down and making it as smooth as possible.
3. Tape one layer of plastic on the base of the box underneath the lid. You only need to tape down one side of the plastic. Leave the opposite side open so you can insert the pie pan later.
4. Tape another layer of plastic across the top of the box, covering the hole you cut out, right underneath the foil-lined flap. Tape down both sides and make sure it's secure.
5. Set the solar oven in the direct sun. Prop the flap open with a pencil. This will reflect the light into the box, helping it to heat up. Preheat the oven for at least 30 minutes.

If you feel like being adventurous try cooking smores in your solar oven. Break graham crackers in half and place them onto the pie pan. Place a marshmallow on each graham cracker square. You'll need to cook the marshmallows first because it takes longer for them to melt than the chocolate. Gently lift the lid and the lower plastic cover and place the pie pan into the oven. You should feel some of the thermal heat already. Make sure to completely seal your oven backup to allow the heat to stay inside the oven.





# THINK ABOUT OUR WORLD:

Watch this video <https://youtu.be/SzCLv36SOo4> to see how developing countries are using solar cookers to preserve the Earth's non-renewable resources such as firewood.

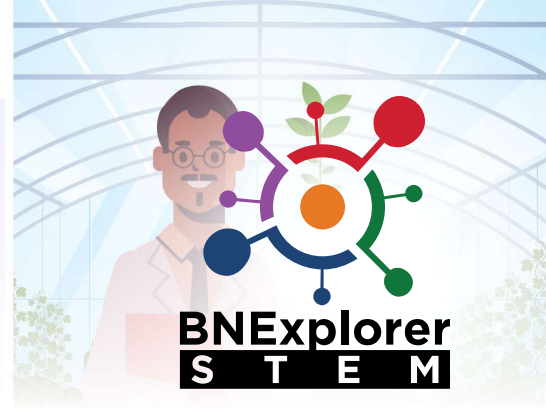


To learn more about climate change visit the NASA website. This will give you a better understanding of how the use of non-renewable resources are impacting our world, and why we should utilize renewable resources.



<https://climatekids.nasa.gov/climate-change-meaning/>

- What is one change you can make in your daily life that will decrease the amount of non-renewable resources you use?



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# EXPERIMENT NOTES