

## Electric Wind Generator

The Electric Wind Generator activity uses recyclable materials to explore how the power of wind can generate clean, renewable energy. Using a fan and small hobby motor to light up LEDs, students experiment with designing efficient windmill blades. The activity can be used as part of a global challenge curriculum exploring clean, renewable energy and can address several NGSS topics such as forces, energy, natural sources, and human impact on Earth systems. Students practice valuable engineering skills as well.

### Topics:

- Natural/Renewable Resources
- Human Impact on the Earth

### Subject(s):

- Earth/Space Science
- Engineering
- Physical Science

**Grades:** 6-12

### NGSS:

Human Impacts on Earth Systems, Developing Possible Solutions

[MS-ESS3-3](#)

[HS-ESS3-4](#)

Conservation and transfer of Energy

[4-PS3-3](#)

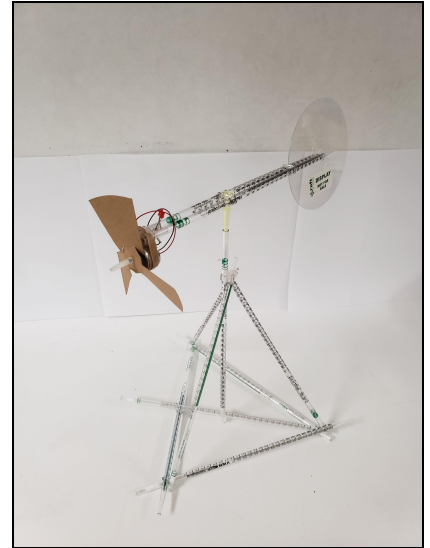
Designing Solutions to Engineering Problems

[4-ESS3-3](#)

### Materials

**WARNING: CHOKING HAZARD - Small parts not suitable for children under 3 yrs. Rubber bands contain natural latex which may cause allergic reactions.**

1. Plastic pipettes, 2mL in 1/100 (10), 2. Rubber band, medium, 3. LEDs, red (2), 4. Small hobby motor, DC, 5. CD, 6. Pipette tips (2), 7. PVC bands (15), 8. Cardstock sheets (30), 9. Manila folders (1-2), 10. Windmill blade blackline masters (<http://bit.ly/FanBlades>)



**Explore** (Click links to view related science content and phenomena)

<http://bit.ly/WindGenerators> (student resource - video)

<http://bit.ly/HarnessPowerfromWind> (teacher resource - document)

<http://bit.ly/WindmillTimelapse> (student resource - video)

<http://bit.ly/WindEnergyGuide> (student/teacher resource - website)

<http://bit.ly/WKTEDtalk> (student resource - video)

### Engineer It

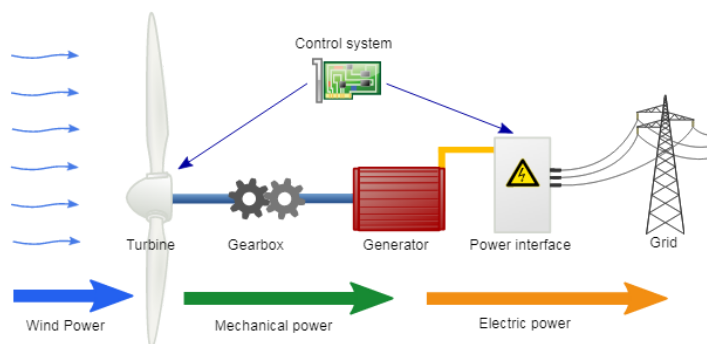
1. Access the activity slideshow - <http://bit.ly/RAFTWindFarm>
2. Go to slide 5 and watch the embedded “how-to” video.
3. Construct the sub-assemblies: 1) Pyramid base, 2) Electric wind beam
4. Attach an electric wind beam onto the pyramid base as shown in the video.

### Design Challenge

Build a working electric windmill with a pyramid base that harnesses the wind to power a light and/or speaker. Use a fan or the actual wind to make the blades spin at an optimal level. Read *The Boy Who Harnessed the Wind* by William Kamkwamba and Bryan Mealer. Compare the engineering of the windmill described in the book to your own design.

### Predict. Experiment. Play!

1. Predict the best blade design that will make the LED light turn on. How fast will the wind need to blow to make the light flash?
2. Once you have your base, beam and blades constructed, experiment with the size, shape, and angle in order to make the most efficient electric wind generator.
3. Draw or describe your current windmill blade.
4. Imagine how you could change the blade to make it spin faster and/or make the light shine brighter.
5. Will the electric windmill work with different blade materials (plastic, aluminum, wood)?
6. Look at the graphic below. Which parts of your windmill design represent the elements depicted in the graphic? If there are elements missing from your design, what are they and how might they be included?



### To show what you learned

- Reflect on your building process: 1) What seemed easy to accomplish? 2) What was challenging in this project? 3) How well did your blades spin on the motor shaft? 4) How did the optimal blade inform your design? 5) Describe how you were able to light the LED bulb.
- Make a video of how you were able to make an electric wind generator
- Write a one-page how-to about making an electric wind generator
- Make a short slide show presentation about your engineering process

### Extensions

- Position multiple electric wind generators in front of a single wind source and compare the results
- With more wire, connect multiple electric wind generators to power one larger device
- Measure the electrical output using a multimeter

### Additional Resources

Visit <https://raft.net> to view these related RAFT ideas:

- Whimsical Wind Vane
- Wind at Work
- Solar Jitterbug
- Solar Collector
- Water in the Balance

### Please provide your feedback

Any information you provide regarding the science content, instructions, and/or facilitation is greatly appreciated!

<http://bit.ly/RAFTkitsurvey>