Windmill Electricity
2024 NHERI Boundary Layer Wind Tunnel Facility REU
University of Florida
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Summary
Students will learn about wind power and how electricity is generated from windmills. Students will then have the opportunity to build their own wind turbines, from pre-made pieces in groups of two to three, and test them in the Boundary Layer Wind Tunnel at University of Florida.

Engineering Connection
This lesson allows students to spark their imagination in what is possible in the reals of renewable energy, as well as begins discussions about what makes clean energy good, and how energy is generated and used every day. The principles of what makes a wind turbine spin also introduce several ideas in the realm of physics and fluid dynamics.
Audience- 6-8th grade

Lesson Objectives
1. Wind has energy which can be harnessed using wind turbines
2. Magnets and wire can be used to create an electric current through motion
3. Windmills utilize giant magnets and coils to generate electricity
4. Size, shape, and pitch of a windmill blade affects how fast the windmill will turn, and how much electricity it can generate

Educational Standards
MS-PS3-5 Energy
MS-ETS1-1 Engineering Design

Material List
Wooden paddles, small
Wooden paddles, medium
Wooden paddles, large
Windmill hub
Windmill stand

Introduction

Wind is a naturally occurring pattern of air moving through space. It has energy to be harnessed! What is electricity? How is it produced? Electricity is created by using magnets and cooper wire, coiled around the magnet inside. When the magnet spins, electricity is created and flows through the wire. This is how power can be made! Wind turbines make the magnet spin- therefore taking the energy from the wind. Today, you'll make your own wind turbine to harvest energy. How can you make it the best as possible?

Procedure

- o Background knowledge
  - ▪ Learn about how energy is created inside of a classroom.
  - ▪ Learn about wind, and the presence of wind turbines.
- o Before the activity
  - ▪ Explain how electricity is made. If a coil and magnet is available, show a slight demo.
- o During the activity
  - ▪ Show an example turbine and pass out materials. Let students create a preliminary turbine.
  - ▪ Test preliminary turbines with a hand fan to make sure that they are all turning the correct way.
  - ▪ Enter the wind tunnel and start testing! Let them trial multiple times with different structures, and watch their peers
- o After the activity
  - ▪ Dis-assemble turbines. Show off the top two designs that produced the most energy output.

Assessment

- o After the first test in the wind tunnel, they will get a chance to revise and return to the test site.
- o If they were able to improve their turbine, they successfully completed the exercise.

Wrap-up

- o Ask students to dis-assemble turbines. Ask them to chat with a neighbor about what length of blade they thought was best for energy production.