NAME PERIOD DATE

WIND POWER 1: DISTANCE AND SPEED

Driving Question | Objective

How does wind speed impact turbine voltage output?

Locations for wind energy sites are carefully chosen. The power generated from wind energy depends on how often the blades are turning, so an area with lots of windy days is required. The turbines also need to be on stable ground and maintenance workers must be able to reach the site. Another consideration is that turbines have to be relatively close to existing power lines so they are easy to connect to a power grid.

Materials

- Wind turbine kit
- Voltage sensor with red and black banana plug leads
- Alligator clip leads (2), green and black
- Box fan, 3 or more speeds
- Masking tape
- Meter stick
- Textbooks for weight (2)

Safety

Follow these important safety precautions in addition to your regular classroom procedures:

- Wear safety goggles throughout the experiment.
- Tie back long hair, remove dangling jewelry, secure loose clothing, and roll up long sleeves.
- Make sure blades are properly inserted in the turbine and screws are secure before turning on the fan.

Consider

You will use a fan as a wind source. Predict the fan distance and speed that will produce the highest voltage:

1. The best fan distance will be:

   a) Far from the turbine (1 m or more)

   b) Close to the turbine (0.5 m or less)

   c) Medium distance from the turbine (at or near 0.5 m)

2. The best fan speed will be:

   a) Low

   b) Medium

   c) High

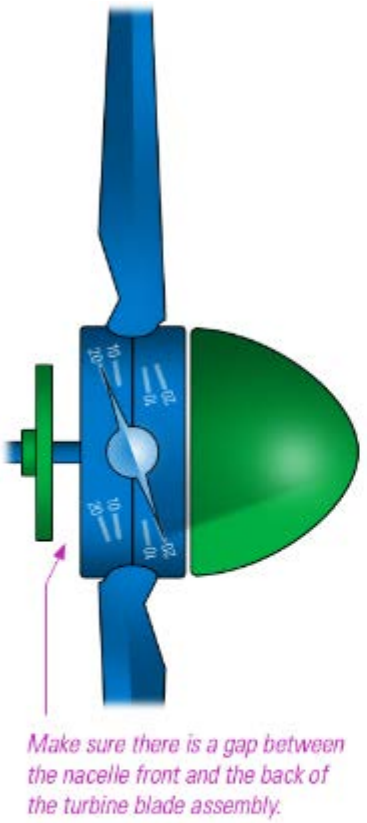
Investigate

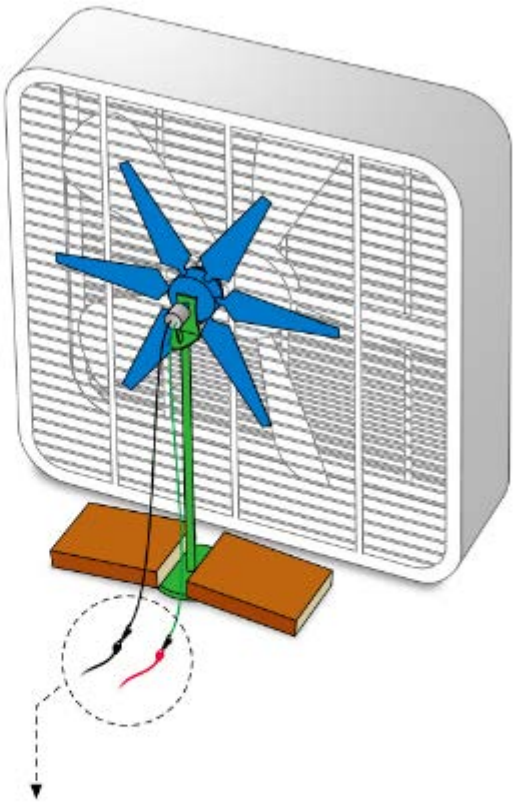
1. Connect the voltage sensor and build a digits display for voltage. Use **Help (?)** if necessary.

2. Assemble a 6-blade turbine with long blades and long tower according to the instruction manual included with the turbine kit.

3. The leaf logo on the blades must face the fan. Blades can be adjusted to different angles, but for now, adjust each blade to the 20° mark.

4. Place the turbine close to the fan without touching it. Make sure turbine blades are exactly parallel with the fan blades as shown.

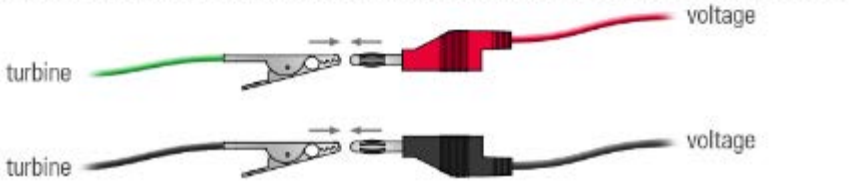




5. Set textbooks on either side of the turbine base for stability.

6. Insert banana plug leads into the voltage sensor if necessary. Use red for (+) and black for (-).

7. Attach alligator clip leads to the motor terminals on the turbine. Clip the leads to the banana plugs as shown. Match black colors.



8. Turn the fan on to its highest setting.

9. Start Collecting Data. If the voltage reads negative, switch the alligator clips on the motor terminals. When voltage reads positive, label the motor terminal with the black alligator clip “Black/-”.

10. Observe the voltage readings for at least one minute to identify the highest voltage possible.

11. Move the fan slowly away from the turbine to determine the distance that achieves the highest possible voltage.

12. Use a 15-cm piece of masking tape to mark the turbine distance that achieves the highest voltage. Align the tape with the post as shown.

13. Measure the distance from the fan to the masking tape. Record the distance in Table 1.

14. Write your name and the distance on the tape. Leave space on the tape for future notes.

15. Find the fan speed that produces the highest voltage at the optimal distance. Record the speed on the tape. Leave space on the tape for future notes.

Table 1: Best Fan Distance and Speed

Criteria	Best Value
Distance	
Speed	

16. Place the tape on the fan for reference in future activities.

17. Stop collecting data and turn the fan off.

Analyze

1. How do your fan distance and speed predictions compare to your results? Use data to support your answer.

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