

# Working with Wind Energy



## Student Worksheet: Design Your Own Windmill

You are working as a team of engineers who have been given the challenge to design a windmill out of everyday items. Your windmill will need to be able to withstand wind from a fan for at least one minute while winding a string or wire to lift a light object such as a teabag. You are working on a budget and will have to "purchase" materials from your teacher to create your design. You may return materials, exchange materials with other teams, but will need to determine the "cost" of your windmill – the least expensive design that meets the challenge will be considered the most efficient design! Your windmill may be vertical (pointing upward from a table) or horizontal (pointing off the edge of a table).

### ◆ Planning Stage

Meet as a team and discuss the problem you need to solve. Then develop and agree on a design for your windmill. You'll need to determine what materials you want to use -- keep in mind that your design must be strong enough to withstand wind from a fan or hairdryer and the base cannot move so it will have to be secured to a table or shelf. Draw your design in the box below, and be sure to indicate the description and number of parts you plan to use. Present your design to the class. You may choose to revise your teams' plan after you receive feedback from class.

Materials Needed and Budget:

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## Student Worksheet (continued):

### ◆ Construction Phase

Build your windmill. During construction you may decide you need additional materials or that your design needs to change. This is ok -- just make a new sketch and revise your materials list and budget.

### ◆ Testing Phase

Each team will test their windmill using a classroom fan or hairdryer -- each windmill will be tested using the same wind speed -- medium -- at a distance of three feet. You'll need to make sure your windmill can operate for a minute at this speed while winding a light object up with a string. Be sure to watch the tests of the other teams and observe how their different designs worked.

### ◆ Evaluation Phase

Evaluate your teams' results, complete the evaluation worksheet, and present your findings to the class.

Use this worksheet to evaluate your team's results in the "Working with Wind Energy" lesson:

1. Did you succeed in creating a windmill that operated for a minute that could lift an object? If not, why did it fail?
  
2. Did you decide to revise your original design or request additional materials while in the construction phase? Why?
  
3. Did you negotiate any material trades with other teams? How did that process work for you?
  
4. If you could have had access to materials that were different than those provided, what would your team have requested? Why?

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## Student Worksheet (continued):

5. Do you think that engineers have to adapt their original plans during the construction of systems or products? Why might they?

6. If you had to do it all over again, how would your planned design change? Why?

7. How did the most "efficient" design (the one with the lowest cost or budget) differ from your own?

8. Do you think you would have been able to complete this project easier if you were working alone? Explain...

9. What drawbacks does a wind turbine have as a reliable source of energy? What technologies exist that might compensate for these drawbacks?

10. What advantages does the windmill have as a renewable source of energy?