MAINE MOBILE BIOLAB
STUDENT HANDOUT

Name:	

Blowin' in the Wind

BACKGROUND INFORMATION

Wind energy is a renewable source of power that converts the kinetic energy of moving air into electricity. Unlike fossil fuels, which release carbon emissions and contribute to climate change, wind energy is clean and sustainable. Wind turbines capture this energy using large blades that spin when air moves past them. The spinning motion drives a generator, which converts mechanical energy into electrical energy that can be used to power homes, businesses, and entire communities. The efficiency of a wind turbine depends on several factors, including wind speed, blade design, and the placement of the turbine.

One of the most critical design elements of a wind turbine is its blades. The shape, length, angle, and number of blades all influence how much wind energy is captured and converted into electricity. Engineers design turbine blades to maximize efficiency by using principles of aerodynamics, the study of how air moves around objects. Like how an airplane wing generates lift, a well-designed turbine blade uses air pressure differences to increase rotation speed. This process allows modern wind turbines to generate significant amounts of electricity, even in areas where wind speeds are moderate. By experimenting with different blade designs, scientists and engineers continue to refine wind turbine technology to make it more effective and adaptable to various environments.

QUICK CHECK: Why is wind considered a renewable energy source?

MATERIALS:

- $1000 BIOLAB Bucks
- Wooden dowels
- One plastic turbine hub
- Materials to construct blades
- Tapes to affix blades to the hub
- Vernier LabQuest
- Vernier energy sensor
- Vernier variable load

PROCEDURE:

1. Investigate the available materials. You will be given $1000 to spend to build your turbine blades.
2. You will need to purchase materials to construct your blades as well as a material to attach your blades to the wooden dowels.

Item	Cost
Balsa Wood Sheet	$200/sheet
Chipboard	$100/sheet
Cardstock Sheet	$50/sheet
Duck Tape	$200/30 cm
Electrical Tape	$150/30 cm
Masking Tape	$100/30 cm
Scissors	FREE
Protractor	FREE
Wooden Dowels	FREE

3. Use the area below to sketch some ideas of the shape of your turbine blade.

4. Once your team has completed their original design, bring it to the instructor for testing. You will be able to adjust your blade angle once the hub is attached to the turbine. You will then have up to three attempts to record your maximum energy output.

Attempt 1:

Material	Blade angle (°)	Energy Output (v)

Attempt 2:

Material	Blade angle (°)	Energy Output (v)

Attempt 3:

Material	Blade angle (°)	Energy Output (v)

QUICK CHECK: List two blade characteristics that can affect the efficiency of a wind turbine.

QUICK CHECK: How does changing the blade angle influence the energy output?

QUICK CHECK: What measurement tells you how successful your design was? (Explain why.)