

*Investigating Renewable Energy* allows students to explore how the sun, wind and water can supply the power to make things move and work. Through fun, hands-on investigations, students discover the basic principles of energy:

- *Energy is what makes things move.*
- *Energy is something that is stored, ready to use and which can be used up.*
- *Energy can change from one form to another (energy transfers).*

*Investigating Renewable Energy* provides the frameworks for students to record their observations, gathered data, questions and discoveries when using the *Renewable Energy Kit*.

The book also provides comprehensive information and activities covering five main areas:

- *What is Energy?*
- *Solar Energy*
- *Wind Energy*
- *Hydropower*
- *Sustainable Future*

Each activity is accompanied by a teacher page presenting background information, teacher notes, additional activities, display ideas and answers.

By using the *Renewable Energy Kit* and completing the activities in *Investigating Renewable Energy*, students will gain an awareness of the need to rely more on nature's resources for our everyday needs. By using renewable energy sources, we will reduce our dependence on fossil fuels and work towards a sustainable environment.

# CONTENTS

Teacher Notes.....	4–5
<i>Renewable Energy Kit</i> Equipment.....	6
<i>Renewable Energy Kit</i> Instructions.....	7
Reflection Sheet.....	8
Assessment Form.....	9

## **WHAT IS ENERGY?**

Energy All Around Us.....	10–11
Fossil Fuels.....	12–13
Renewable Energy.....	14–15
Energy in the Home.....	16–17
Changing Energy.....	18–19
Types of Energy.....	20–21

## **SOLAR ENERGY**

The Sun.....	22–23
Solar Energy.....	24–25
Exploring Solar Power.....	26–29
Comparing Light Sources.....	30–31
Solar Power – Design an Investigation.....	32–33
Uses of Solar Energy.....	34–35
Build Your Own Solar Oven.....	36–37
Solar energy – Advantages and Disadvantages.....	38–39

## **WIND ENERGY**

Wind Energy.....	40–41
Exploring Wind Power.....	42–45
Wind Power – Design an Investigation.....	46–47
Wind Farms.....	48–49
Make an Anemometer.....	50–51
Wind Energy – Advantages and Disadvantages.....	52–53

## **HYDROPOWER**

Moving Water.....	54–55
Exploring Hydropower.....	56–59
Pressure vs. Speed Investigation.....	60–61
Hydropower – Design an Investigation.....	62–63
Hydroelectricity.....	64–65
Water Energy.....	66–67
Power of Water Investigation.....	68–69
Hydropower – Advantages and Disadvantages.....	70–71

## **SUSTAINABLE FUTURE**

What is Sustainability?.....	72–73
More Renewable Energy Sources.....	74–75
Designing an Energy-Efficient Home.....	76–77
Sustainable Transportation.....	78–79
Energy Use in Your Community.....	80–81
Glossary: Energy Terms.....	82

**Wind Energy**

Have you ever watched a documentary or news bulletin showing the powerful force of a hurricane or tornado? Such winds possess an enormous amount of energy and can have devastating effects on property, people and the environment.

Humans have been harnessing wind energy for thousands of years. It is believed the Chinese have been using wind to pump water for crops for 4,000 years. Windmills have been used in Europe for centuries to turn heavy granite stones to grind grains such as wheat, barley and corn to make flour. Traditionally, the Dutch used windmills to pump sea water from low-lying estuaries, creating land that could then be farmed.

**What makes the wind?**

The sun warms the air unevenly, so some patches are warmer than others. When the warm air rises, cooler air from surrounding areas rushes in to fill the space, creating wind.

Wind can be “captured” by wind turbines—tall towers with large propellers on the top—and the energy harnessed. This moving energy (kinetic energy) can be changed into electricity (electrical energy) using a generator. The generators are small and light and can be housed at the top of the tower.

The stronger the breeze, the more electricity that can be produced, so the wind turbines need to be placed in windy areas such as by the coast, on hilltops and in gaps between mountains. A number of towers are often placed together, creating a “wind farm.” The more towers and the more wind, the more electricity that can be made.

Wind energy is a renewable energy source that produces no air pollution and has relatively little impact on the environment

**Answer these questions.**

**1.** List three uses of wind energy.

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**2.** In your own words, explain why wind occurs. Include a diagram.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



**3.** Fill in the blanks to explain how wind energy is changed to electrical energy.

Wind is captured by wind \_\_\_\_\_  
 — tall towers with large \_\_\_\_\_  
 at the top. Small, light \_\_\_\_\_  
 housed behind the propellers change the wind  
 energy to \_\_\_\_\_.

**4.** Where should wind farms be situated for the best results?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**5.** On the back of this sheet, list three benefits of using wind power as an energy source.

## Exploring Wind Power – I



### What you need:

- Universal base
- Universal mast section
- Wind turbine
- Output dials
  - Power meter
  - Light display (LED)
- A windy day or a desk fan or hair dryer
- Buzzer
- Motion display (gears)

### What to do:

1. Make sure the ON/OFF switch on the universal base is in the OFF position.
2. Plug the universal mast into the universal base.
3. Add the wind turbine.
4. **Outside:** On a windy day, go outside to an open area.  
**Inside:** Plug in the fan or hair dryer and aim it directly at the wind turbine.
5. Place the power meter output dial in the universal base and press ON.
6. Record the result in the first column of the table (page 45).
7. Place each of the other output dials in the universal base and record each of the results in the table (page 45).

### Hints for drawing a diagram

- Use a sharp pencil.
- Use a ruler for straight lines.
- Use all the space you have.
- Label all parts.
- Rule a line from each piece of equipment to your label.
- Give your diagram a title.

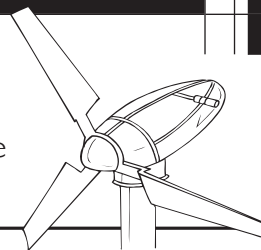


### 1. Diagram

Draw a diagram of the wind power energy kit.

## Wind Power – Design an Investigation

1. Design an investigation using the wind energy *Renewable Energy Kit*.
2. Conduct the investigation and record your results below. (A table is an effective way to display results.)



*What you need:*

*What to do:*

*Diagram:*

*Results:*

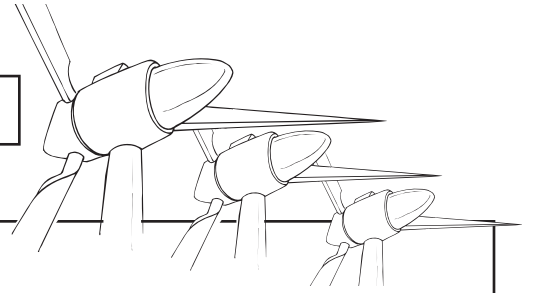
Explain your results. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## Wind Farms

1. Use the Internet, library and your own knowledge to plan an information report about wind farms. Include accurate facts and vocabulary. Research where wind farms are found in your area/state/country.

Title

Classification (A general statement about the topic)



Description (Divide the description into sections; e.g., What are wind farms? How do they generate electricity? Where are they found and why? Why they are used?)

• Reports are written in the third person; e.g., The turbines, they work by ...

• Reports use factual language rather than imaginative; e.g., The small, light generators are housed ...

• Reports use technical vocabulary and subject-specific terms; e.g., propeller, volume of air ...

Conclusion (A final comment about the subject of the report; it may contain a personal opinion.)

• Reports have information organized into paragraphs.

2. Write your report on a separate sheet of paper. Edit your work and present a finished copy with diagrams and pictures.