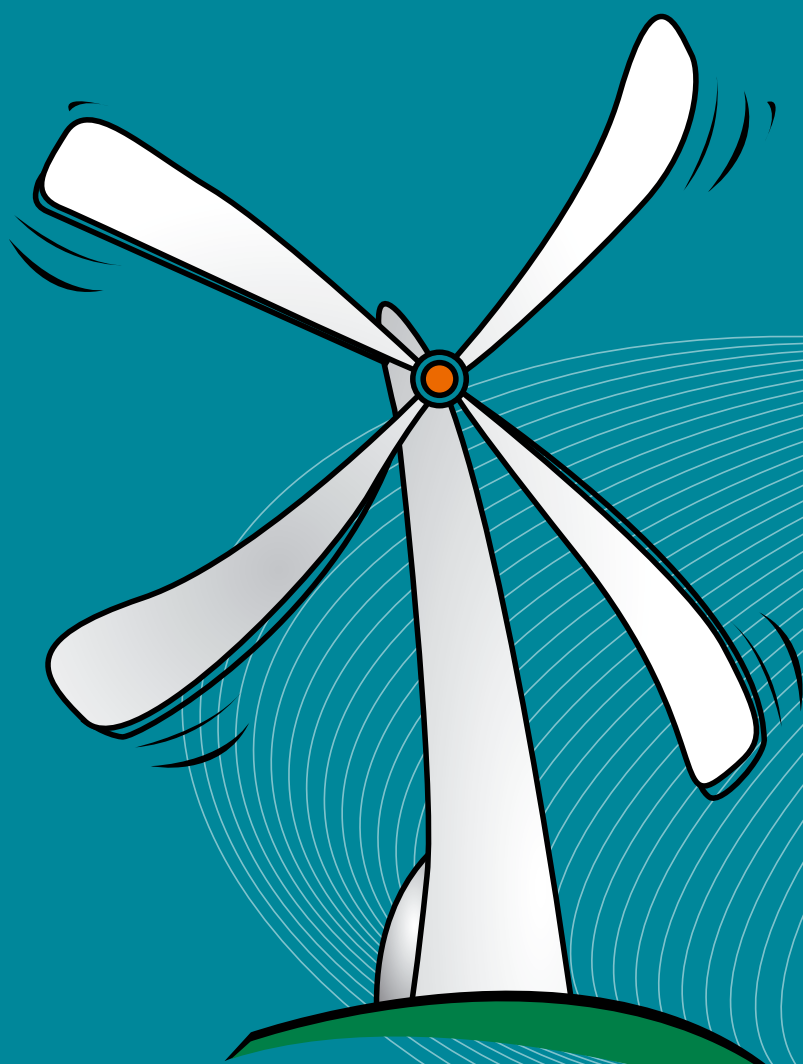


# Renewable Energy

*key message: fossil fuels are becoming scarce and are non-renewable. we need to use renewable sources of energy which are less damaging to the environment.*



**seai curriculum link:**

Content Strand – Environmental Awareness and Care  
Strand Unit – Environmental Awareness

**skill development:**

Experimenting, designing and making.

**integration opportunities:**

SESE: Geography – Air, water, impact of human activity on the environment, weather, climate and atmosphere

# Renewable Energy

**Key Message: Fossil fuels such as oil, petrol, gas and coal are becoming scarce and are non-renewable. Other sources of energy such as wind, water, solar and crops are now being used to satisfy the energy needs of the future. These are renewable and less damaging to the environment.**

## Before you start

Today we are going to look at fuel and energy. Some forms of fuel are renewable and some are non-renewable – what could that mean?

### Fossil Fuels or Non-Renewable Energy

- ☛ What is a fuel? *Something that gives energy*
- ☛ Can you name any fuels?
- ☛ How is the school heated?
- ☛ How is your own house heated?
- ☛ If you have a car at home, what fuel does it use?
- ☛ Why are some fuels called fossil fuels? *Discussion about dinosaurs and fossils.*

Discussion on how energy cannot be created from nothing i.e. if you want electrical energy you have to use up some other kind of energy. Because fossil fuels are running out and cannot be replaced (non-renewable), then it is necessary to find new ways of heating our homes, running our cars, providing electricity etc.

## Background

### Renewable energy

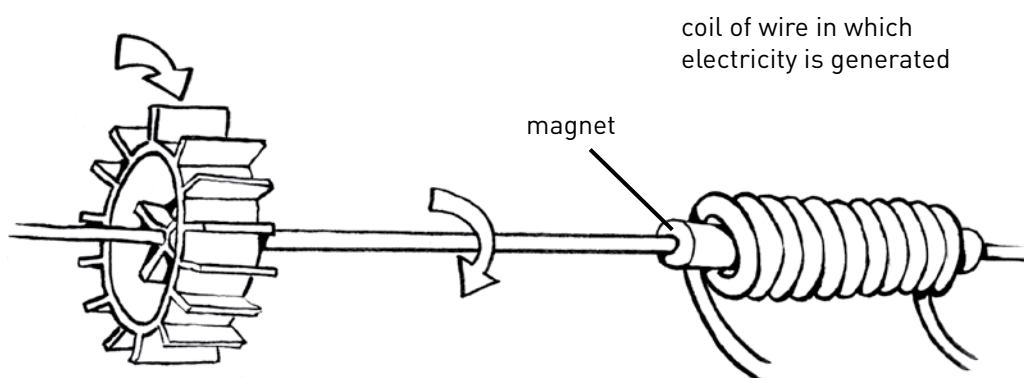
- ☛ There are two main ways which scientists are investigating, which will attempt to replace fossil fuels. These are:
  1. Using energy which is already there such as wind, moving water and sun. Wind can turn sails and water can turn turbines which make electricity. If a wire which is connected to a circuit is made to move between the north and south poles of a magnet, then an electric current is produced in that circuit.
  2. Growing something which can be burned to produce energy (bio-fuel or bio-mass) e.g. sugar cane is grown in Brazil to make fuel.

# Renewable Energy

- Are there other ways of producing energy? *Discussion about windmills: years ago, they were used mostly for grinding corn into flour and for pumping water. Now they are mainly used to produce electricity.*
- Do the children know any windmills or watermills?
- Have they seen any solar panels? *Parking meters in cities and towns across Ireland work by solar panels.*
- There are 2 kinds of solar panels:
  1. Solar thermal panels collect heat from the sun and heats water (most commonly used in Ireland and grant aided by SEAI);
  2. photovoltaic or pv panels produce electricity when they are exposed to the light of the sun – the light which shines on the pv cells creates an electric field causing electricity to flow.
- Discussion on the sun without which we could not survive because people and animals eat plants that get their energy from the sun. It also gives us heat and light.
- How can we trap energy from the wind or moving water to make something move.

## How electricity is made

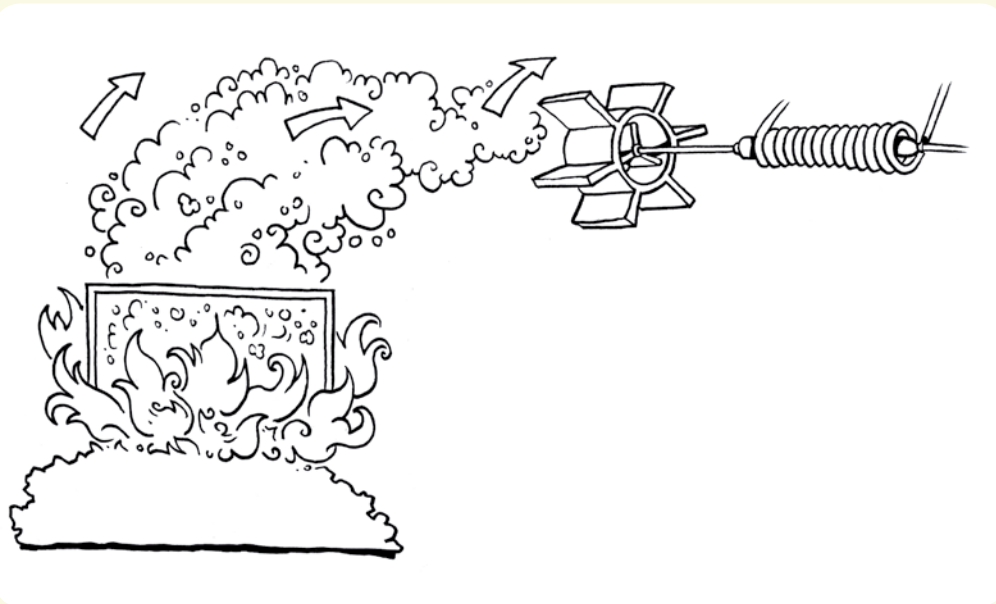
Electricity is made in a generator. A generator is a magnet fixed to a rod inside a coil of wires (see diagram). When the rod is turned, an electric current is generated in the wires. The rod can be turned by two ways:



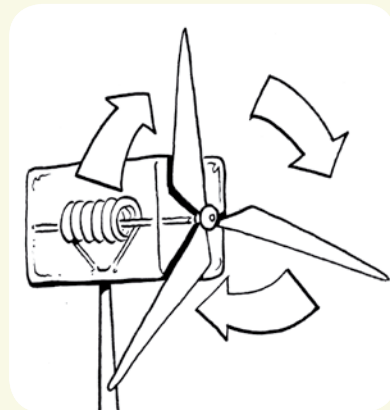
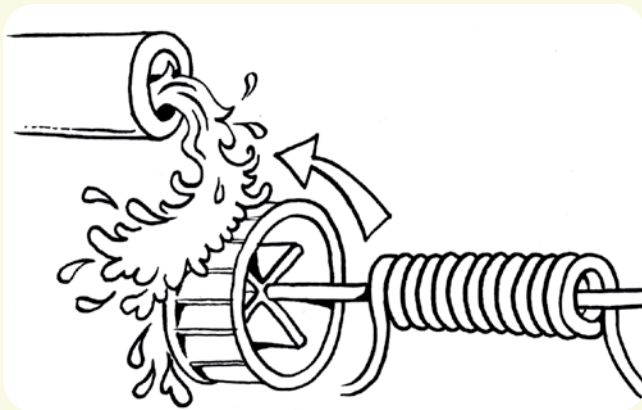
the magnet is rotated by a turbine which is moved when water, air or steam flow over the blades

# Renewable Energy

- By a steam turbine: coal, oil, gas and peat are used to heat water which makes steam. The steam is aimed at a turbine to make it turn and generate electricity.



- By pushing: flowing water pushes the turbine in a hydro-electric scheme; the wind pushes the blades of a wind turbine to generate electricity.



# Renewable Energy



How can we investigate solar power?

## You will need

Two crocodile leads

Motor

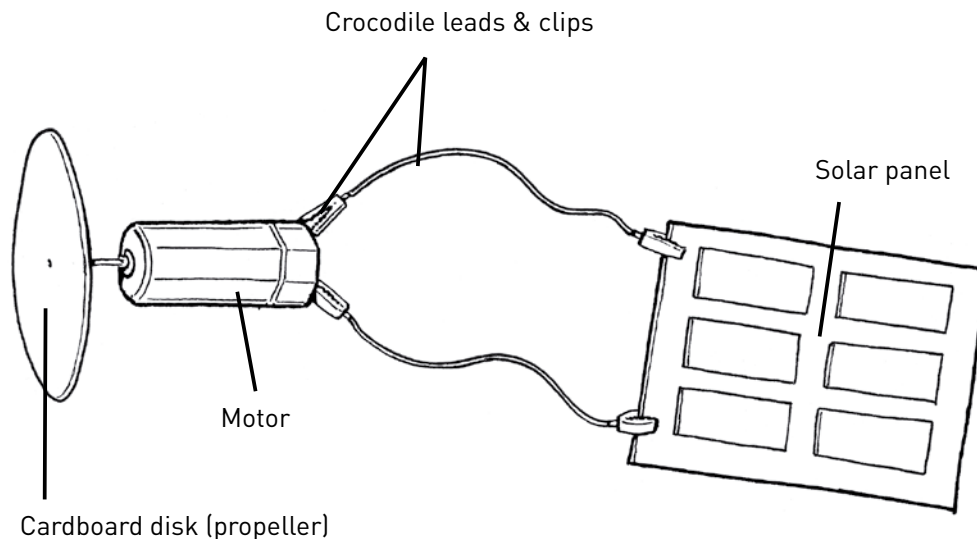
Propeller or cardboard disc

1.5v solar panel (the photovoltaic type – available from any primary science suppliers)

## Steps

1. Connect the terminals of the motor to the terminals of the solar cell using the two crocodile leads.
2. Put the cardboard disc or the propeller on the spindle of the motor and place the solar cell in direct sunlight. The disc/propeller should spin. If there is no sunlight an artificial light may be sufficient, provided it is bright enough e.g. 100 Watts.

### SOLAR POWER – INVESTIGATION 1



**Note:** Do not subject the solar cell to excessive heat or it might warp the panel; remember it is light and not heat that makes it function.

# Renewable Energy



## How can we investigate hydro power?

### You will need

Cardboard or rigid plastic  
Pencil or straw  
Basin

Sharp knife or scissors  
Flowing water  
Cello tape

### Steps

1. Use the template at the end of this lesson plan to make a water wheel.
2. Cut out the circle using the cardboard or the plastic. This will be the wheel. Plastic is better as it won't go soggy when placed under the water.
3. Cut a small hole in the centre of the circle.
4. Cut out the 6 rectangle shapes (these are the blades of the wheel) and cut as indicated.
5. Place the 6 blades around the wheel and secure with cello tape.
6. Put the pencil or straw through the middle.
7. Place the water wheel above a basin of water or a sink.
8. Use a jug or the tap to pour water on the water wheel to make it move.



## How can we investigate wind power?

### You will need

A4 piece of paper or light plastic  
Cello tape  
Hairdryer as a source of wind (optional)

Scissors  
Drawing pin  
Pencil

### Steps

1. Cut out the square from the template at the end of this lesson plan using the paper or light plastic.
2. Cut from each corner to the mark 2cm from the middle.
3. Place A in the middle and secure with cello tape. Do similar with B, C and D.
4. Place a drawing pin in the middle of the windmill and attach to pencil.

# Renewable Energy



## How can we generate our own electricity?\*

### You will need

- Motor
- Pulley which fits on spindle of motor (obtainable from any primary science suppliers)
- Thread
- Bulb and bulb-holder
- 2 crocodile leads and clips and leads

If the children have used motors in a class on electricity they will have discovered that a motor is something that has a spindle which turns around when the motor is turned on i.e. connected into an electric circuit.

Conversely, if you can make the spindle of a motor turn around (by any method e.g. by hand, wind, water, steam) and connect the terminals of the motor with wires you will get an electric current in the wires! This is how electricity is made in generating stations.

### Steps

1. Put the pulley on the spindle (shaft) of the motor.
2. Connect the two terminals of the motor to the 3-volt light bulb.
3. Use a piece of thread to turn the wheel (it may need to be wrapped round the pulley a number of times and then given a quick jerk).
4. What happens? With some practice you should get the bulb to light, indicating that electricity has been produced from movement energy.

\* Why not find out about plans for Ireland's future generating system. Go to [http://www.seai.ie/Renewables/Smart\\_Grids/](http://www.seai.ie/Renewables/Smart_Grids/)

### Discussion

- Were the children able to get the disc or propeller to spin? Did the brightness of the light make any difference? Or the distance of the solar panel from the light?
- Were they able to get the sails of the windmill to spin? Or the watermill wheel to turn?
- Did anybody manage to produce electricity from their own energy turning the pulley?
- How could the designs of any of these be improved?

# Renewable Energy

## Did you know?

An offshore wind farm in Arklow produces electricity for up to 16,000 buildings.

People used oil for 5000 years before the first oil-well was drilled in 1857 in America.

In ancient Egypt oil oozed out of the ground. They only started to drill holes when it stopped oozing out.

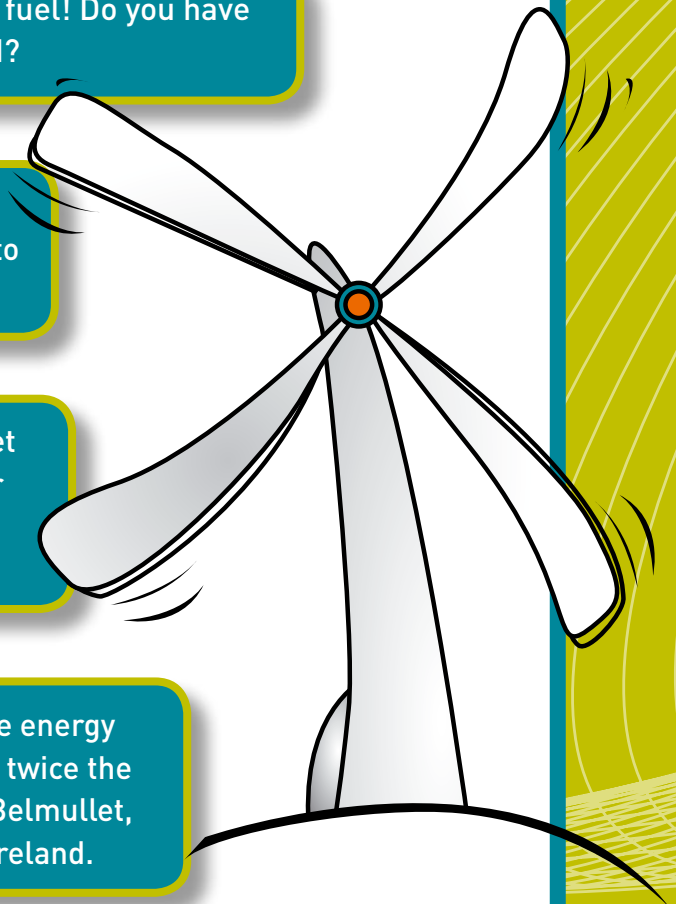
Electric cars were popular in France and America about 100 years ago but petrol cars improved and were able to go faster and whenever you wanted. You had to wait about 10 hours for the batteries of an electric car to re-charge before you could go again! But technology has improved and the electric car is making a comeback. SEAI's "Wind to Wheels" project on the Aran Islands is testing electric cars being run on wind energy. The electric cars are charged using electricity which has been generated from the wind.

An aeroplane holds nearly 200,000 litres of fuel! Do you have a car at home? How many litres does it hold?

Plastic is made from oil. The Chinese have found a way of turning some plastics back into oil again? Why could this be really useful?

There is enough fuel in the tank of a jumbo jet to drive an average car around the world four times! Do you think there is any connection between air travel and global warming?

Ireland has one of the greatest sources of wave energy in the world. By 2020 SEAI plan to power a city twice the size of Cork using electricity from the Ocean. Belmullet, Co. Mayo was chosen to test Ocean Energy in Ireland.





# Renewable Energy

The following is a chart of the times required for energy to be produced from different sources:

Sources of Energy	Production Time	Position on Time Line
Direct solar heat	Minutes	2 cm
Wind	Hours	3 cm
Water	Days and weeks	4 cm
Bio-fuel or bio-mass	Months, years, or decades	5 cm
Coal, oil, natural gas	Millions of years	200 cm

In order to understand this more clearly you can make a time-line as follows:

Get a 2 metre length of tape (the sort from cash registers if you can get some) and using a metre stick, begin at one end of the tape and measure the distances mentioned in the third column and label these lines. Place a heavy mark to indicate the division between the renewable and non-renewable sources of energy.

Time-line:

e.g. \_\_\_\_\_  
0                      50                      100                      150                      200 cms.

**Note: The position on the time-line is not to scale, it would be impossible to get a tape long enough to represent fossil fuels!**

Which sources of energy on your time line are most commonly used?

Can you think of any problems related to the most commonly used fuels?

Ireland has lots of bogs and has produced electricity by burning turf or peat. Are there any peat burning power stations still in Ireland? *West Offaly Power and Lough Ree Power.*

Can you find out if there are any garages in Ireland which are selling biofuels for cars? Does an ordinary car engine take biofuel or do you have to get it altered?

Complete the two worksheets at the end of this lesson plan.

# Renewable Energy

## Useful Websites

[www.seai.ie/schools](http://www.seai.ie/schools)

[www.primaryscience.ie/activities\\_introduction.php](http://www.primaryscience.ie/activities_introduction.php)

[www.epa.ie/researchandeducation/education/primary/](http://www.epa.ie/researchandeducation/education/primary/)

[www.askaboutireland.ie](http://www.askaboutireland.ie) Eco Detective Resource for Primary Schools

[www.coolkidsforacoolclimate.com/](http://www.coolkidsforacoolclimate.com/)

[www.energyquest.ca.gov/index.html](http://www.energyquest.ca.gov/index.html)

[www.eere.energy.gov/kids](http://www.eere.energy.gov/kids)

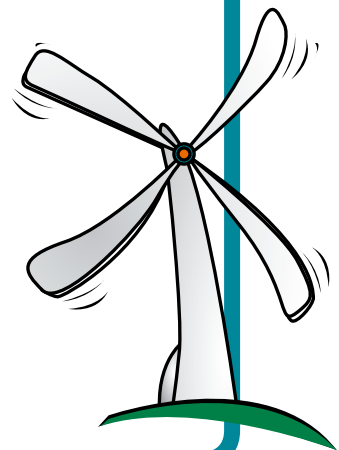
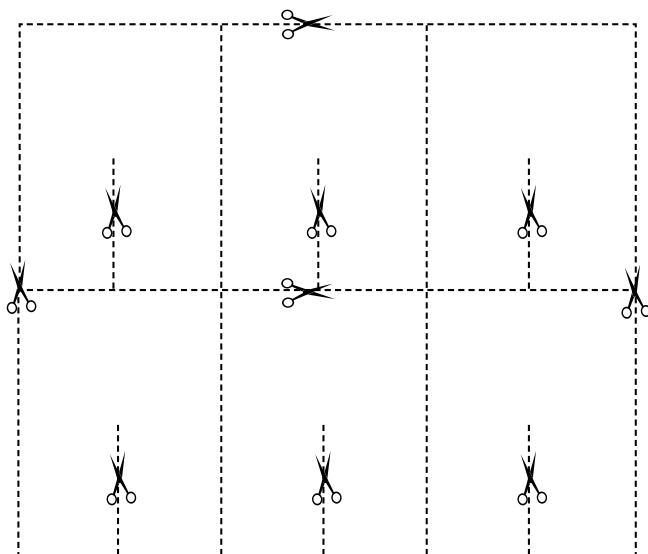
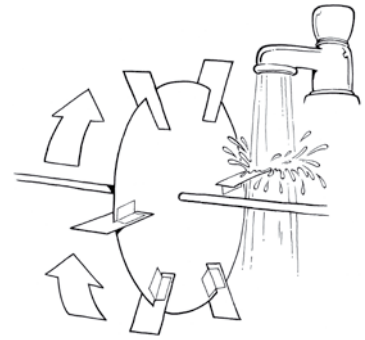
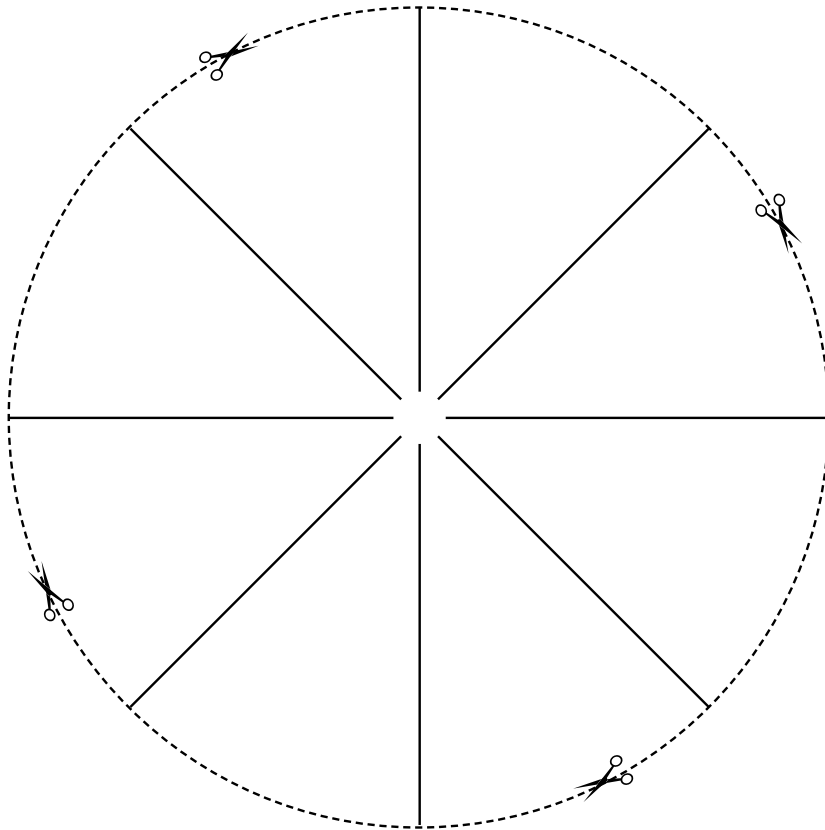
[www.learn-energy.net/education/](http://www.learn-energy.net/education/)

[www.suschool.org.uk](http://www.suschool.org.uk)

# Renewable Energy

recording sheet - photocopy and use

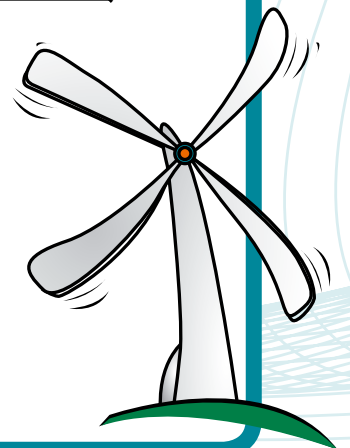
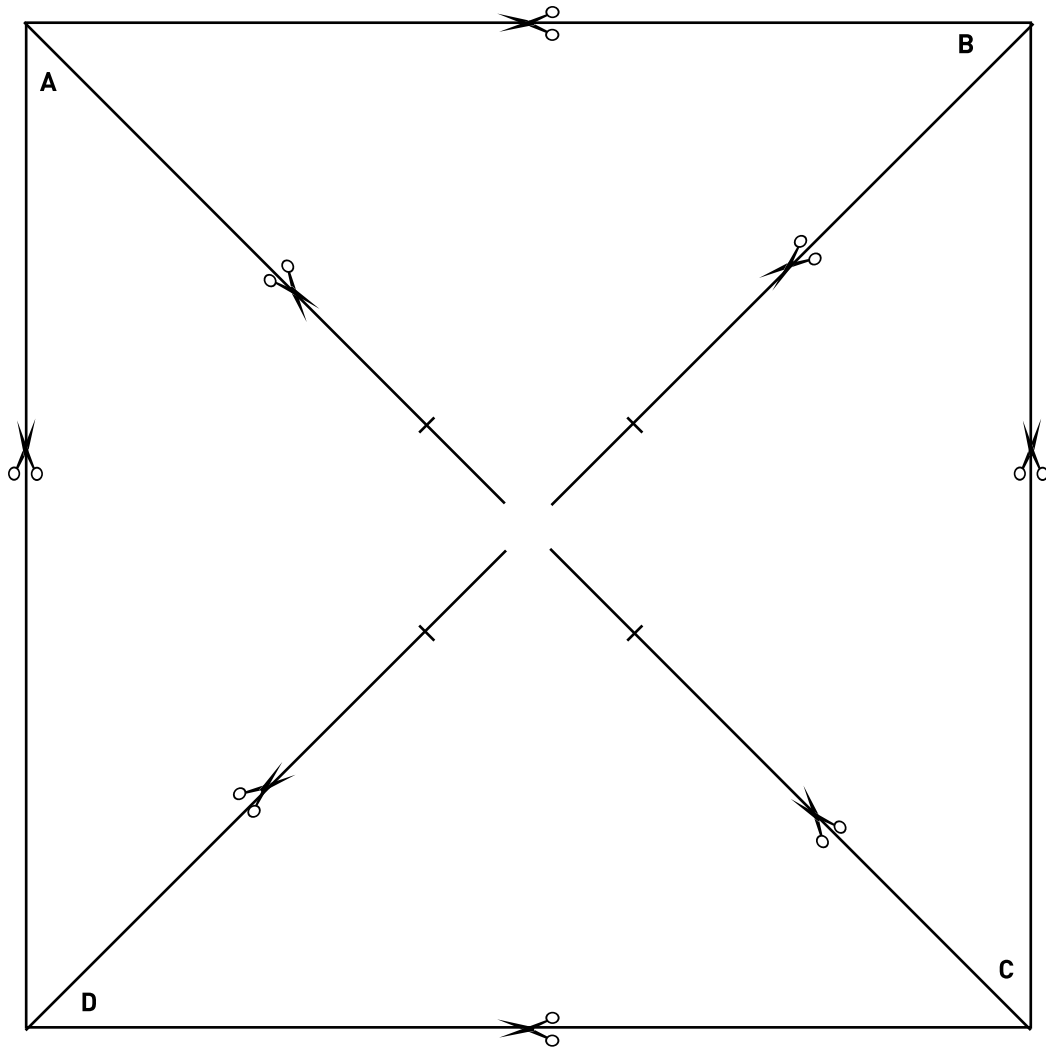
## Investigation 2 Template Water Wheel



# Renewable Energy

recording sheet - photocopy and use

## Investigation 3 Template Windmill

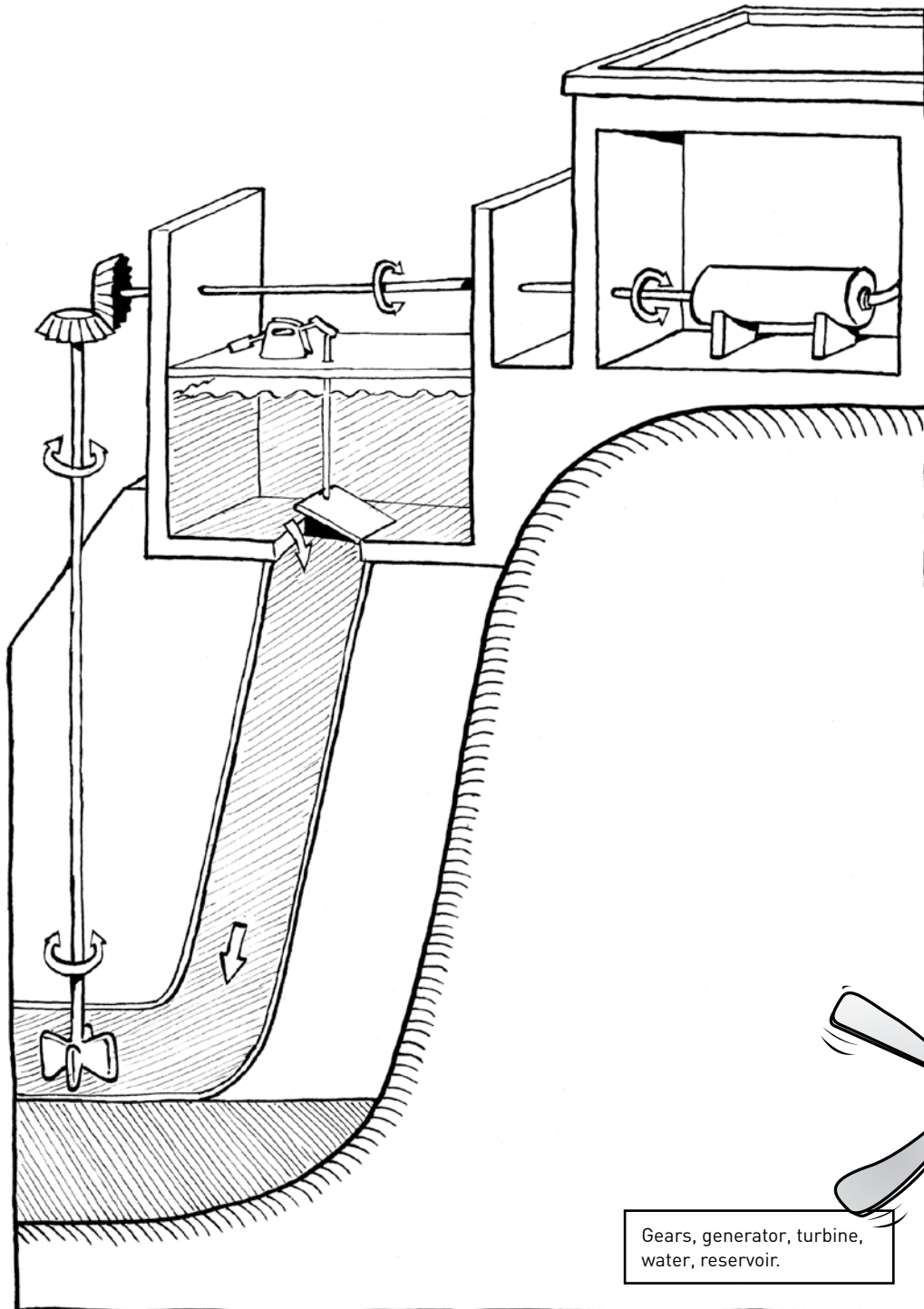


# Renewable Energy

recording sheet - photocopy and use

## Hydropower

Using the words on the box below, label the different parts of this simple hydro-electric scheme



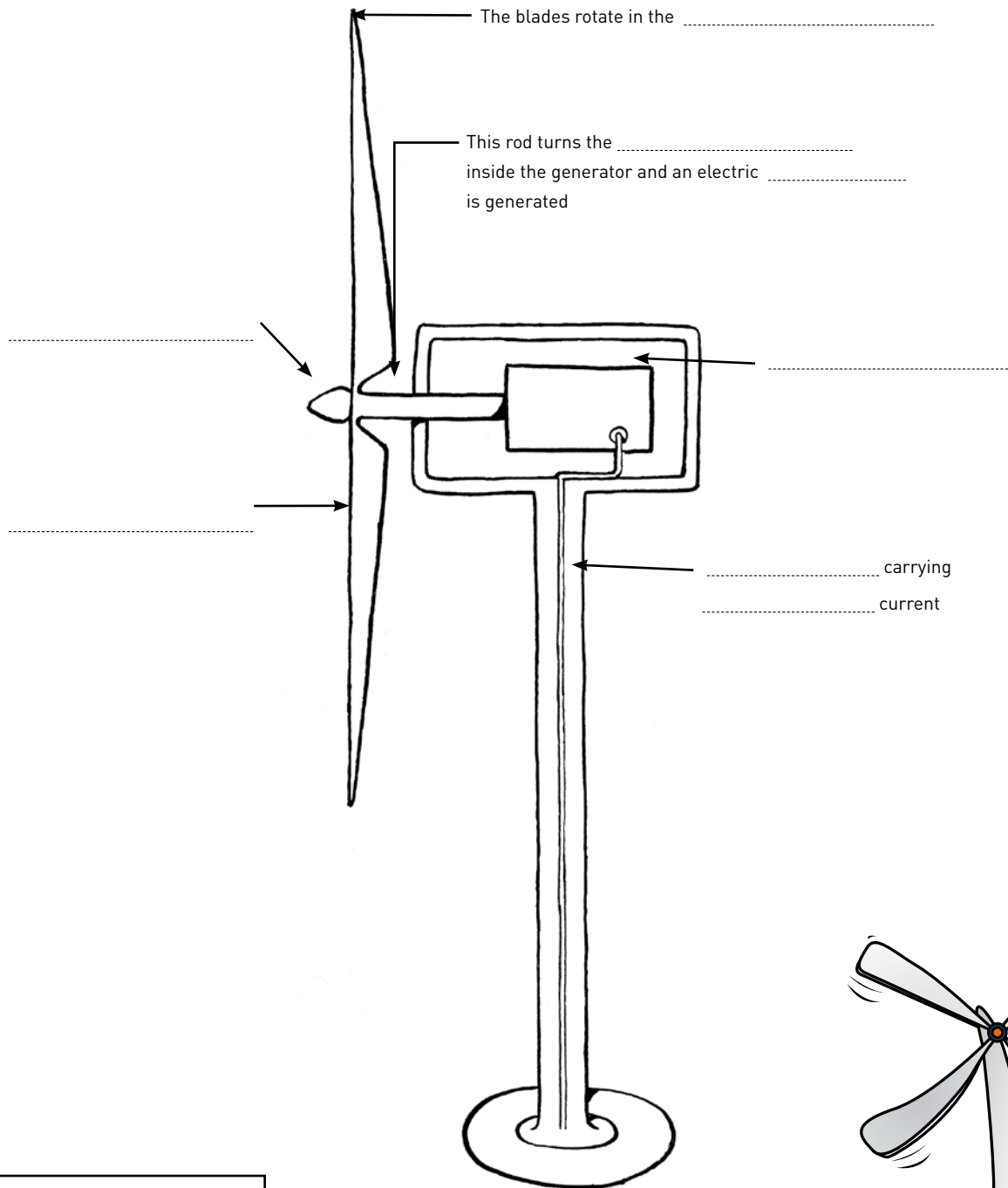
Gears, generator, turbine,  
water, reservoir.

# Renewable Energy

recording sheet - photocopy and use

## Wind Power

Fill in the gaps using the words in the box below



Blades, hub, wind, magnet, wire,  
electric, current, generator.