# Investigating Hydro Power

*Hydro power uses the energy of falling water to spin a turbine which generates electricity*

Aim: To investigate the best design

for a hydro power station

Materials Required: - Motor and small 300ml water bottle

 - Assortment of propellers

 - Multi-meter

- Leads with plugs

- Crocodile clips

- A source of water (tap) and sink

## Task 1

## Assemble the Hydro Power Station

1. Fix any propeller onto the pin of the motor.
2. Connect a lead to each terminal on the back of the turbine.
3. Plug one lead into the multi-meter connection called “COM” and the other lead into the connection marked “V”.
4. Switch the multi-meter to the 2V or 20V scale.
5. Carefully hold the apparatus under a running tap.
6. Be careful NOT to get the multi-meter or the leads wet.
7. Record the voltage produced.

## How can we optimise the power we get from the hydro power station?

Note: It is important to change only one variable at a time in order to do a fair scientific test. Remember to record all your findings.

## Task 2

Try different propellers

1. Attach different propellers onto the turbine in turn and hold each under the running tap. Record the voltage produced each time.
2. Which shape or number of blades produces the most power?

## Task 3

Try different heights

1. Hold the turbine in the sink below a running tap.
2. Start with the turbine held near the tap and then lower it away from it into the sink. Now bring it closer to the tap again.
3. What happens to the speed of the turbine as the distance between it and the tap increases?
4. What happens to the voltage each time?
5. How does the distance the water has to fall affect the voltage produced by the turbine?

From your experiments, what did you find were the best conditions for producing electricity from your hydro power station?

Extra, Extra ! Read all about it!

Daily Echo Exclusive

“Today some S2 students made a solar fan using a small motor, a fan or propeller and solar panels. They also got a red LED and a buzzer to work with the solar panel. (but sometimes they had to reverse the bulb and buzzer connections to the leads from the panel to get them to work”. Can you do the same?

**Investigating Solar Power**

*Solar voltaic panels generate electricity by using the energy found in sunlight to move electrons in the panel*

Aim: To investigate the best design and placement for solar panels

Materials required: - Solar panels

- Multi-meter

- Leads with plugs

- Crocodile clips

- A small lamp

## Task 1

## Assemble the equipment

1. Connect leads to each terminal on the solar panel unit.
2. Plug one lead into the multi-meter connection called “COM” and the other lead into the connection marked “V”.
3. Switch the multi-meter to the 2V or 20V scale.
4. Take the solar panel to a source of light or outside.
5. Record the voltage produced.

## Task 2

##  How can we optimise the power from the solar panels?

Note: It is important to change only one variable at a time to do a fair scientific test. Remember to record all your findings.

Try connecting more than one panel together

1. Using additional leads, connect more than one solar panel in series

 (Ask your teacher if you are unsure what this means).

1. Put the panels in the same place as your last test and record the voltage produced. How has it changed?

Try different locations

1. Test your solar panels in different locations.
2. Try changing the angle of the solar panel to the light.
3. Try shading part of the solar panels with your hand or some paper to imitate the effect of buildings or trees.
4. If the weather changed, would the output change?

Where do you get the most power?

Remember to write down your results.

What did you find were the best conditions for producing electricity from your solar panels?

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**Investigating Wave Power**

*Wave power stations use the energy of the wave to move a piston or turbine which generates electricity*

Aim: To investigate the best design

for a wave power station

Materials Required: - A wave generator (either built or to be built)

 - Multi-meter

- Leads with plugs

- Crocodile clips

- A source of water (tap) and a sink or bucket

## Task 1

## Assemble the wave turbine

1. Connect a lead to each wire from the terminal block.
2. Plug one lead into the multi-meter connection called “COM” and the other lead into the connection marked “V”.
3. Switch the multi-meter to the 2V or 20 V scale.
4. Fill a bucket or sink with water. The level must not be above the tape (a maximum depth of 14-15 cm to ensure water does not splash onto the motor).

## Task 2

Remember: It is important to change only one variable at a time to do a fair scientific test. Remember to record all your findings.

Place the generator in the water and raise and lower it. The fan will turn and produce electricity.

Try pushing the generator into the water at different speeds

 What makes the propeller turn faster – a slow or a quick movement?

What would the waves be like to produce a lot of power?

## Task 3

Try experimenting with the depth of the water

Does the depth of the water make any difference to the amount of power generated? (how fast the propeller turns).

What is the best depth to get the biggest voltage?

## Task 4

This time use the results of Tasks 2 and 3. Use best depth of water and the best speed.

Plunge the generator downwards in the water and measure the voltage on the multi-meter.

From your experiments, what did you find were the best

conditions for producing electricity from your wave power station?

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 Can you do the same?

**Investigating Wind Power**

*Wind turbines generate electricity by using the power of the wind to spin a generator*

Aim: To investigate the best design

and placement for a wind turbine

Materials Required: - Motor with small empty 300ml water bottle

 - Assortment of propellers

 - Multi-meter

- Leads with plugs

- Crocodile clips

- Hairdryer

- Clamp stand, boss head and clamp

## Task 1

## Assemble the wave turbine

1. Clamp the turbine in the clamp stand so the bottle is horizontal.
2. Choose a propeller and fix it to the pin at the front of the motor.
3. Connect a lead to each terminal on the back of the turbine.
4. Plug one lead into the multi-meter connection called “COM” and the other lead into the connection marked “V”.
5. Switch the multi-meter to the 2V or 20V scale.
6. Switch on the hairdryer or take the wind turbine outside.
7. Record the voltage produced.

## Task 2

## How can we optimise the power we get from the wind turbine?

Note: It is important to change only one variable at a time to do a fair scientific test. Remember to record all your findings.

Tests (if indoors using a hairdryer)

a) Experiment with distance between the turbine and hairdryer.

b) Try changing the angle between the turbine and hairdryer.

c) Remember to write down your results.

Try different propellers

1. Try each of the propellers in turn and note down the voltage produced.

Which shape or number of blades produces the most power?

Optional: If outside you can try different heights

1. Find a windy spot.
2. Starting at ground level, hold the wind turbine at different heights and record the voltage produced at each.

 Which is the best height for the wind turbine?

From your experiments, what did you find were the best conditions for producing electricity from your wind turbine?

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