Nkula Hydroelectric Power Station

Lesson Aims

- To learn the process of hydroelectric power
- To learn how to analyse an image
- To give a presentation on hydroelectric power
- To learn how to work as a group

Rules for group work

When doing group work, it is important to set down your rules so that the students know your expectations. Here are some suggested rules which you could adapt for your own purpose. It may be a good idea for the students to have them copied into their exercise books so that they can refer to them each time you do group work.

- Ensure that everyone can see the resources
- Ensure that everyone has the opportunity to contribute ideas
- Listen carefully and respect each other's ideas
- It does not matter if you cannot agree, a variety of opinions is good
- Ensure that the task is completed properly and in time
- Stop and listen to the teacher when requested

Background info

- Over 90% of electricity in Malawi is produced by hydroelectric power.
- Only a small percentage is used for domestic (home) use. The majority is used for industry and irrigation.
- Water hyacinth was a plant introduced into Africa by Europeans. Unfortunately, it grows very quickly. As a result rivers become clogged up and flow slower.

Script for images (student version on p. 3)

1. Malawi is in Sub Saharan Africa. (G)
2. 20% of Malawi is covered by Lake Malawi which is up to 700 metres deep. (K)
3. The lake flows into Shire River, providing a massive source of ***renewable***, pollution free energy to generate hydroelectric power. (D)
4. Hydro electric power requires basic technology like this ***turbine***, but on a large scale. It would only take 14 turbines of this size to produce all of Malawi's electricity supply. (I)
5. The process starts at a dam like this one in Nkula. The dam wall helps to provide a ***constant flow rate*** of water into the power station. (A)
6. The water is then ***channelled*** down pipes to increase its flow rate as it enters into the power station. (L)
7. The force of the water rushing through this pipe spins a turbine at over ***250 rpm*** (B)
8. This axel connected to the turbine below, turns a ***generator*** above. One turbine can produce ***20 megawatts*** of power. (J)
9. Unlike other forms of power generation such as nuclear or fossil fuel, there is very ***little pollution***. The electricity is then distributed via pylons across the country. (H)
10. Deforestation is causing the river banks to erode. This also clogs up the rivers and makes the current flow slower. As a result less electricity is produced. (E)
11. As the current flows slower plants such as this ***water hyacinth*** are able to grow. They are a serious problem as they could clog up the turbines. (C)
12. This machine scrapes the dam wall clean 24 hours a day to prevent blockages such as plants from getting into the power station. (F).

Answers to worksheet question 2. (see p.3)

SLIDE 1.			SLIDE 2.			SLIDE 3.			SLIDE 4.		
G	K	D	I	A	L	B	J	H	E	C	F

Tasks

Viewing the images 10 mins

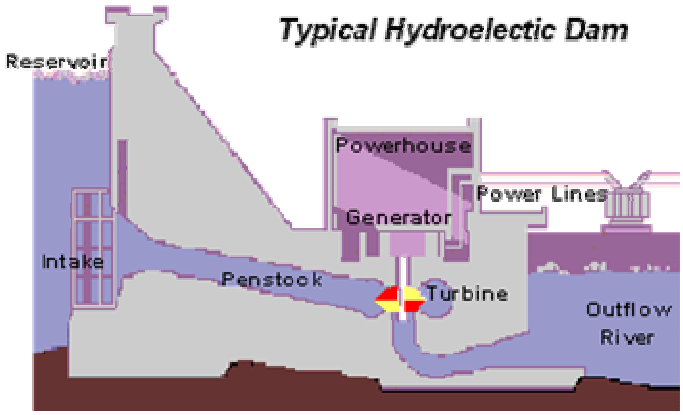
- Put students into mixed ability groups or roughly the same size.
- Give each group a slide.
- Ask the groups to delegate someone to record the group's ideas.
- Ask the groups to write a list of ideas of what they can see in their image.
- After 5 mins, ask the groups to report back to the class and to show their image.

Script for the images 15 mins

- The teacher reads the 12 phrases (muddled version p.3) and gives any extra explanation required (especially ***highlighted*** words).
- Students look at the phrases and decide which phrase goes with their image
- Discuss as a class the correct order of images
- Ask a student from each group to stand at the front of the class with their image. Line up the students in the right order. Ask them to show their image and read out the correct phrase. In this way the students can see the images like a TV programme presentation.

Personal record of hydroelectric power 20 mins

- Students should draw a labelled diagram to show the process. The teacher may need to draw an example on the board to assist the class. (see http://ga.water.usgs.gov/edu/hyhowworks.html)



Plenary (What have we learnt?)

- Ask students to close their books
- Collect in the images and do not show them to the students
- Show the images and ask the class to remember the phrase in the right order

Homework

- Students should complete their diagram on hydroelectric power
- A possible extension exercise would be for students to write a passage on the advantages of using hydroelectric power instead of other forms of energy such as wood, coal/charcoal and oil.

Additional resources

- A DVD video has been created of Nkula Power Station. To receive a copy email global@notredamehigh.norfolk.sch.uk . It can be used to show the images in the right order. Ask students to take notes from the video. Then rewind the video and turn down the volume. Ask students to put up their hands when they see a scene that they can describe. Pause the video and listen to their narration then restart the video.
- The global home website has an extensive gallery of images of Nkula that you can use. There are links to other sites including one showing the process of hydro electric power.
- There is an additional webpage on deforestation. As people cannot afford the electricity they chop down trees for firewood. This leads to soil erosion and bank erosion which then has a knock on effect on the production of hydroelectric power and raises costs. Thus causing a vicious circle.
- The Malawi website also contains a lesson to have a debate between the different groups involved in creating a hydroelectric power station.

1. Read the following phrases and choose 3 which best describe your group's slide.

A	The process starts at a dam like this one in Nkula. The dam wall helps to provide a ***constant flow rate*** of water into the power station.
B	Malawi is in Sub Saharan Africa.
C	As the current flows slower plants such as this ***water hyacinth*** are able to grow. They are a serious problem as they could clog up the turbines.
D	The lake flows into Shire River, providing a massive source of ***renewable***, pollution free energy to generate hydroelectric power.
E	Deforestation is causing the river banks to erode. This also clogs up the rivers and makes the current flow slower. As a result less electricity is produced.
F	This machine scrapes the dam wall clean 24 hours a day to prevent blockages such as plants from getting into the power station.
G	The force of the water rushing through this pipe spins a turbine at over ***250 rpm***
H	Unlike other forms of power generation such as nuclear or fossil fuel, there is very ***little pollution***. The electricity is then distributed via pylons across the country.
I	Hydro electric power requires basic technology like this ***turbine***, but on a large scale. It would only take 14 turbines of this size to produce all of Malawi's electricity supply
J	This axel connected to the turbine below, turns a ***generator*** above. One turbine can produce ***20 megawatts*** of power.
K	20% of Malawi is covered by Lake Malawi which is up to 700 metres deep.
L	The water is then ***channelled*** down pipes to increase its flow rate as it enters into the power station.

2. Write the letters of the phrases you chose in the boxes below your slide name.

SLIDE 1.			SLIDE 2.			SLIDE 3.			SLIDE 4.		

3. As each group feeds back its answers, put the correct letters into the remaining boxes.

4. In the box below draw a diagram showing all the separate stages in the process of making hydroelectric power.