



Activity 4.3

USING RENEWABLE AND NON-RENEWABLE ENERGY

Aim:

When you have completed this activity you will have prepared scenarios about the use of renewable and non-renewable energy.

Procedure:

- Read through the information about renewable and non-renewable energy described in the Fact Sheet.
- Write two paragraphs. The first will describe what the world might be like in the future if we continue to use large amounts of fossil fuels and don't develop

renewable energies. The second will describe what the world might be like in the future if we use mainly renewable energy sources.

Writing your paragraph/s:

- Introduction: In one sentence state what you think the world might be like if we do/don't use renewable energies.
- Body: In two to four sentences describe in detail what this world would be like to live in. Include your ideas about health, lifestyle, environment and jobs.
- Conclusion: In one sentence state what we need to do today to make this kind of future a reality.



Fact Sheet No. 5

TRADITIONAL NON-RENEWABLE PRODUCTION METHODS

Energy is obtained in two ways: from non-renewable sources and from renewable sources. This Fact Sheet is about non-renewable energy sources found under the earth's surface.

These are the 'fossil fuels': coal, oil and natural gas.

Millions of years ago some of the energy from the sun was taken up by forest trees, plants and animals as they grew. These died and decayed, and as they were buried under layers of soil and rock, the energy, as carbon, became locked up with them. Sometimes the earth containing this material was subjected to great heat and pressure. These forces broke down the biomass into coal, oil or gas.

Coal

Coal is mined from the earth in a number of ways. It can be mined underground by cutting shafts or tunnels down into the seam of coal. Trolleys or a conveyor belt are used to bring the coal to the surface. Today much coal is obtained by the

open-cut method, if the overburden is not too deep. The overburden of soil and rock is completely removed, and the coal is cut out in tiers that slope inwards. Huge trucks drive up and down these tiers to take out the coal. A more recent approach is strip mining. This involves cutting a narrow strip and when all the coal is removed from it, a parallel strip is cut and the overburden is used to fill the previous strip. In this way, the mined area can be gradually rehabilitated with soil and plants.

The coal is usually crushed and sent in train wagons to the place where it will be used. Its destination depends on the type of coal it is. Thermal coal goes to power stations to produce electricity. Coking coal goes to factories to provide heat for industry and to make metal such as iron and steel.

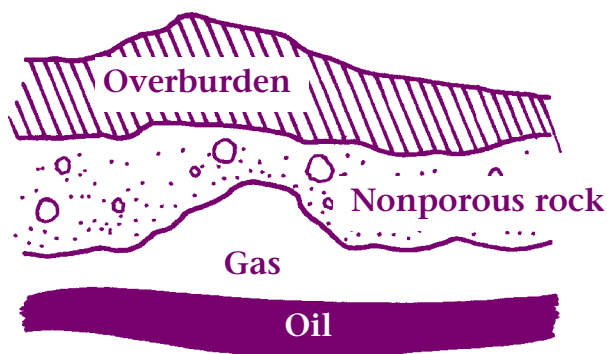
Oil

Oil and gas are obtained by drilling into the earth's surface, either on land or under the sea bed. Where oil is found under the sea, huge drilling rigs are built where drillers can live and work to extract this resource.

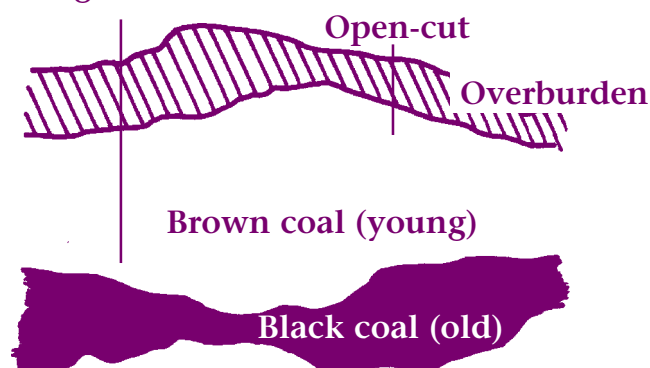
Oil is transported around the world in huge tankers. Occasionally, there are accidents, resulting in oil spillage into the sea. The consequences for coastal environments and bird and animal life are severe, and the clean-up is very costly.

Natural gas is also shipped by tanker, but in a liquefied form, after it has been chilled to -161 degrees Celsius. Both oil and gas are also transported across land by pipeline. They have a lot of uses such as fuel for transport, heating, and making electricity, as well as making chemicals such as plastics and fertilizers.

All these traditional methods of production have social and environmental impacts. Most mining companies are now aware of their responsibilities in negotiating with local indigenous peoples when they are exploring; to rehabilitate the land when they leave; and to promote safe use of their products to minimise air pollution.



Underground shaft





Activity 5.1

IDENTIFYING DIFFERENT WAYS OF OBTAINING NON-RENEWABLE ENERGY

Aim:

When you have completed this activity you will have identified different ways of obtaining non-renewable sources of energy.

You will need:

- Remembered information from the Fact Sheet

Procedure:

- Read the Fact Sheet carefully.
- Form into groups of three for a cooperative learning exercise.
- Number off from 1 to 3. Number 1 in each group will make up some questions about COAL to be answered by the other two members. Number 2 will make up questions about OIL and GAS to be answered by the other two. Number 3 will have the task of checking the Fact Sheet to make sure the answers are correct.
- Do the following matching exercise individually to show how much you have learned.

Try to match the following items from column A with the appropriate items in column B.

Chocolate Cream Open-cut Mining

Your teacher will need to set this up. You will need:

- One ice-cream container per group of four students. In the bottom place a layer of chocolate cream biscuits. Cover with sand and, if available, place a piece of grass turf on top.
- Another ice-cream container to hold the mined material
- One tablespoon per group

Procedure:

- Each person in the group takes a turn to remove the 'overburden' with the spoon
- When the 'seam' of coal (choc cream) is reached, the group decides how to extract this from the 'rock layers' on either side.
- Then the group decides how to rehabilitate the land with what is in the second container so that the original layers are returned.
- The group discusses the question: how is this exercise like real mining?

COLUMN A

1. Shafts or tunnel required
2. Tankers
3. Coal used for electricity
4. Mining companies
5. Overburden
6. Pipelines
7. Strip mining
8. If the overburden is shallow
9. Drilling rigs
10. Coal used for industrial heating

COLUMN B

- Carry gas and oil
- Must rehabilitate land they have mined
- Cause environmental damage if oil spills
- Underground coal mine
- Built over the level of the sea
- Coking coal
- Rock and soil over a seam of coal
- Thermal coal
- Open-cut method
- Narrow mining trenches can be gradually rehabilitated.

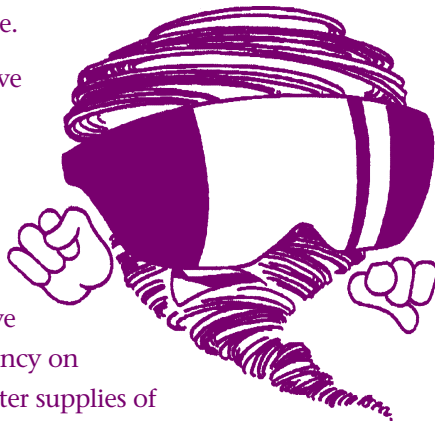


Activity 5.2

GRAPHING ENERGY PRODUCTION

Australian energy-producing industries link into the global economy when coal, oil and gas are imported or exported. At current production levels, Queensland has enough black coal for another 400 years. Australia is the largest exporter of black coal in the world. Coal is Queensland's biggest export earning commodity. Thirty-six per cent of export coal is sent to Japan and about 25 per cent to Western Europe.

Since the 1980s we have been almost self-sufficient in crude oil. But these reserves could be exhausted within 20 years, and we may have to return to a dependency on imports. We have greater supplies of natural gas, and export some in liquid form.



Australia both imports and exports crude oil and oil products, because a mix is required to make different fuels. Export earnings from crude oil are worth \$2 billion a year and liquid natural gas (LNG) earned \$1.6 billion per year. We export some oil to Asia, but also import oil from Indonesia, Saudi Arabia, Vietnam, United Arab Emirates and Papua New Guinea. We export liquid natural gas from the Northwest Shelf off Western Australia to Japan. In 2000, a deal was signed to buy natural gas from Papua New Guinea and transport it by pipeline to Gladstone in Queensland.

Australian energy-producing industries link into world ecological systems when our coal, oil and gas are burned, releasing gas and pollutants into the atmosphere. Greenhouse gases stay in the atmosphere, possibly contributing to global warming. Other pollutants have a more direct effect on us as they become part of the water cycle. These are hazardous at the local level, but can also be carried long distances by air movement. In Europe, acid rain is responsible for damaging large parts of forests.

Aim:

When you have completed this activity you will be able to show in graphic form how Australia's energy production is linked to global economic and ecological systems.

You will need:

- Information from the Fact Sheet as well as the information above
- A blank outline map of the world
- A good atlas

Procedure:

- Read the information. Draw a graph to show the value of coal, oil and natural gas to Australia. Put energy resources on the horizontal axis.
- Take the blank outline map of the world. Using the atlas, find all the places mentioned in the information above, and mark them on the map.
- Decide on a legend showing coal, oil, natural gas and air pollution in different colours. Draw this legend at the bottom of the map.
- Using the information above, draw arrows to and from Australia to show exports and imports. The arrow head should point to the country we export to, and towards Australia for imports. Draw the arrows in the colours you chose to represent the three energy resources in your legend.
- Do some research on world wind patterns. You might use key words like climate patterns, atmospheric pressure or wind patterns. Your atlas might possibly show these on a map. Wind patterns change from season to season, so choose one season and draw arrows in the appropriate colour to show where Australia's air pollution might travel.

