

Energy crisis – what energy crisis?

Activity:

This activity addresses a wide range of actual or potential sources of energy and their possible development.

Use a question and answer session to draw out from students as many different energy sources as they can think of. They can also consider whether each source is renewable or non-renewable, together with examples of successful usage and drawbacks. (The Table may be used by the teacher to guide the discussion, or issued to students for a quicker session).

Give students the map of a hypothetical country and ask them to mark on the map (see Student Sheet) where each type of energy source might be developed. (For those who find the use of maps difficult, the block diagram (See Figure 1) could be used as an extra aid, with the labels deleted electronically, or by using correction fluid). Ask groups of students to nominate four different sources of energy to which they would allocate priority. They should be able to give their reasons.

Student learning outcomes:

Students will be able to:

- name a range of potential energy sources
- discuss the pros and cons of several sources of energy
- explain why they would chose a particular energy source for a particular region and situation.

Student practical or teacher demonstration:

Student worksheet

Time needed to complete the activity:

30 minutes

Preparation and set-up time:

Nil

Resources:

Worksheet(s) per student

Ideas for leading into the activity:

Discussions about sources of energy are frequently in the news. This activity could well be used to follow up such news items.

Ideas for following up the activity:

Use the activity, "Oil and natural gas in the U.K. – did they get it right" to provide some real figures for the use of energy in an industrialised country. Link either or both activities to concerns about the human impact on global climate change.

Look for data about the uses of energy in the media, or on websites, and develop students' skills in the interpretation of graphs etc.

See www.oilandgas.org.uk

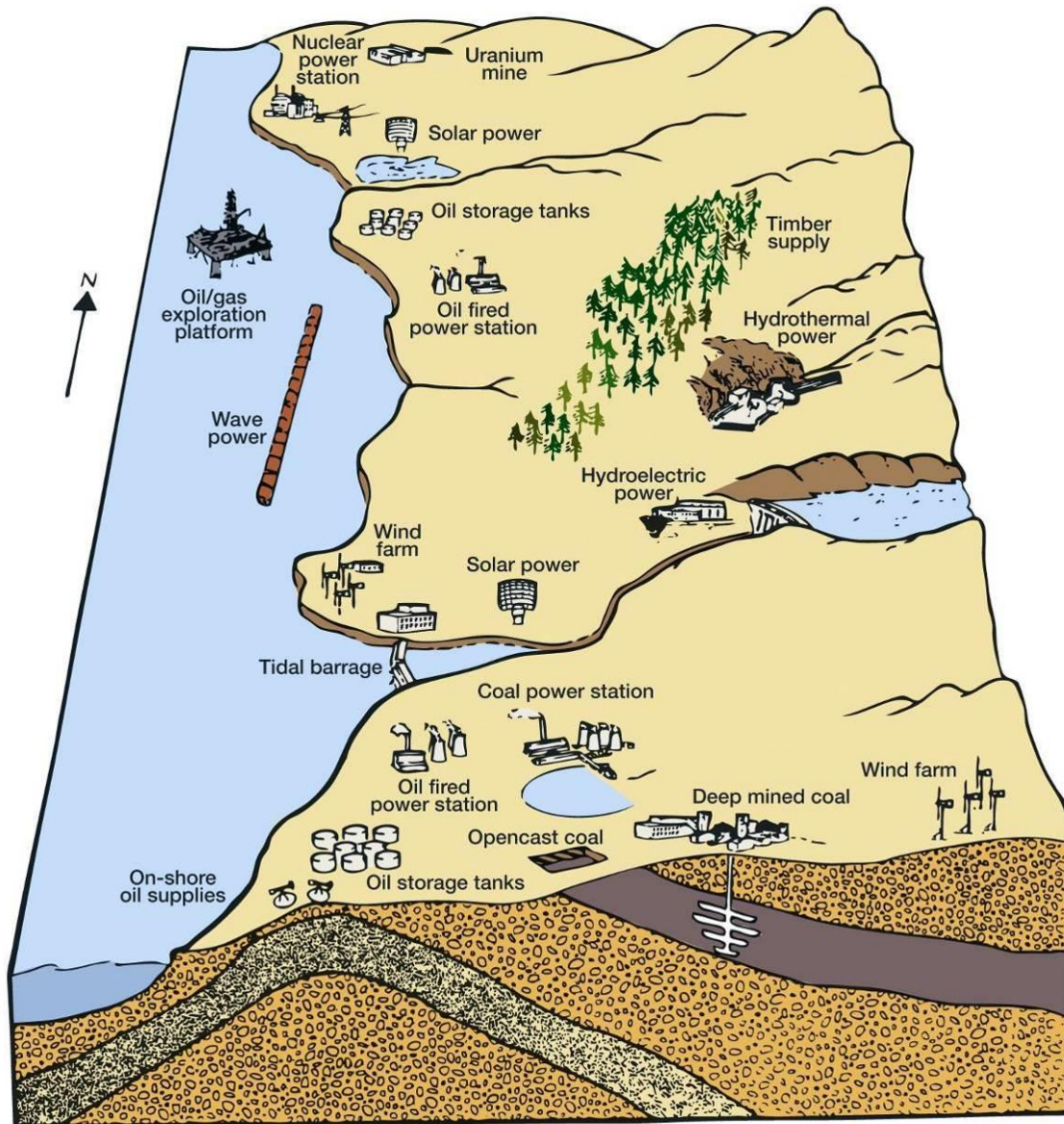
Link with the Economics or Geography Departments at your institution to develop further activities.

Source of activity:

First published as part of the *Crisis in Kiama: which energy source now* activity, in the Science of the Earth 11 – 14 booklet, *Power source: oil and energy* by the Earth Science Teachers' Association in 1992. Geo Supplies, Sheffield.

Possible sources of energy

Potential energy sources	Renewable or non-renewable?	Problems with usage	Successful large scale use today?
Oil	Fossil fuel so non-renewable	Burning atmosphere pollutes	Most widely used energy source today (almost 40% of primary energy supplies)
Gas	Fossil fuel so non-renewable	Burning atmosphere pollutes	Widely used
Coal	Fossil fuel so non-renewable	Burning atmosphere pollutes	Of lessening importance in Europe but growing rapidly in China and India
Oil shale	Fossil fuel so non-renewable	Burning atmosphere pollutes	Exploited in only a few areas, where other fuel sources are not available – technology being developed
Tar sands	Fossil fuel so non-renewable	Burning atmosphere pollutes	Big resources in Venezuela and Canada. Beginning to be exploited, technology being developed
Uranium (nuclear)	Non-renewable but reprocessing and use of breeder reactors helps	Radioactivity pollution problems and risk of major pollution disaster	Fairly large scale usage and increasing
Geothermal	Non-renewable except in active volcanic areas, since energy is extracted at a much faster rate than it can be replaced	Non-polluting	Some small scale projects are in operation in active volcanic areas such as Italy, Iceland and New Zealand. Even smaller projects are working in other areas such as Southampton and France
Ground-source heat pumps	depends on solar heating of uppermost 100m or so of ground, therefore renewable	Needs an aquifer. Needs electrical input to drive pumps	Of growing importance in many countries. Very efficient
Water (hydro)	Renewable	Non-polluting but large new reservoirs must be created	Widely used in water-rich countries (eg New Zealand, Norway and Britain) but not available in dry or flat areas
Waves	Renewable	Non-polluting	At experimental stage only
Wind	Renewable	Non-polluting but wind farms look unsightly	Increasing usage both onshore and offshore
Tides	Renewable	Non-polluting but tidal barrages affect estuarine environments and shipping	Some fairly large schemes working on suitable estuaries today (eg in France)
Solar	Renewable	Non-polluting but large areas of solar panels look unsightly	For large scale production, at experimental stage only
Burning natural wood	Non-renewable at the rate wood is used	Burning atmosphere pollutes	Still wide scale usage for domestic purposes in developing countries (eg in Africa)
Burning dung or other agricultural residues	Renewable but major loss of nutrients to soil	Burning atmosphere pollutes	Wide scale usage for domestic purposes in developing countries (eg in India)
Biogas, produced by anaerobic digestion of organic matter in closed tanks to produce methane	Renewable		Widely used in China and on some British farms
Biomass, energy produced from fast-growing crops	Renewable	Land not available for growing food crops	Sugar is grown and fermented to produce alcohol in some countries. In other areas, fast-growing timber is grown and burnt
Burning rubbish	Renewable	Burning atmosphere pollutes	In Nottingham, domestic rubbish is burned to produce hot water
Refuse dumps	Renewable		Methane is locally recovered from dumps of domestic waste and used as fuel



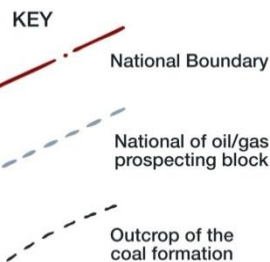
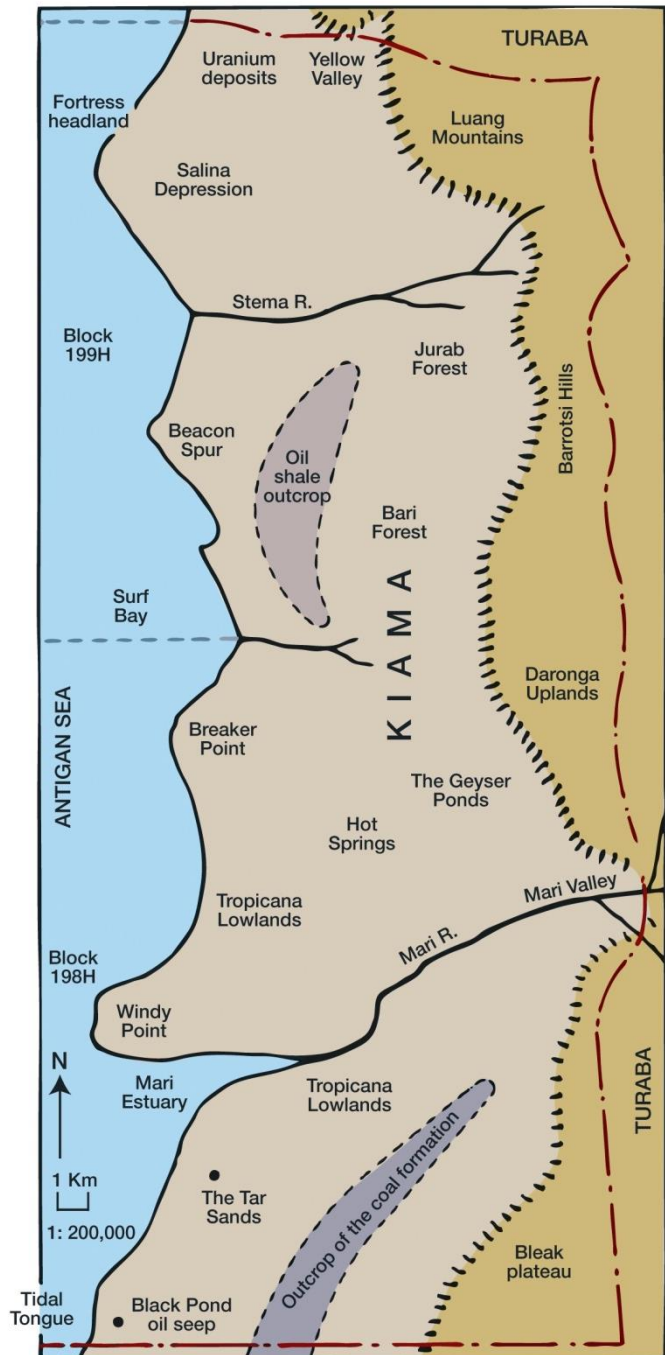
Labelled block diagram of the hypothetical country, showing possible development of energy resources
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- Think of all the various sources of energy that might possibly be developed by a country.
 - Write a list of them.
 - Note down whether each energy source is renewable or non-renewable.
 - Give any problems with the usage of each source of energy.
 - Name any successful large scale use of each source of energy that you know about.
- Study the map. It represents a small coastal country called “Kiama”. It is surrounded by a much bigger neighbour, “Turaba”. Until recently, Kiama bought oil from Turaba to supply virtually all its energy needs, but Turaba has now cut off these supplies. Therefore, Kiama has to develop its own resources. The map suggests a wide range of possible energy sources within Kiama, or lying in its own coastal waters.

Work in a small group to:

- discuss which of these resources could be developed.
- list them.
- show where you would locate the equipment to make use of each source.
- choose **four** different resources to which you would give priority. Be prepared to give your reasons for your choices.



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