UNIT 2

MANAGING ENERGY USAGE

Introduction

This unit looks at the use of energy by organisations and its impact on the environment. You will look at energy use in general and within your own organisation. You will carry out an energy audit in your own workplace.

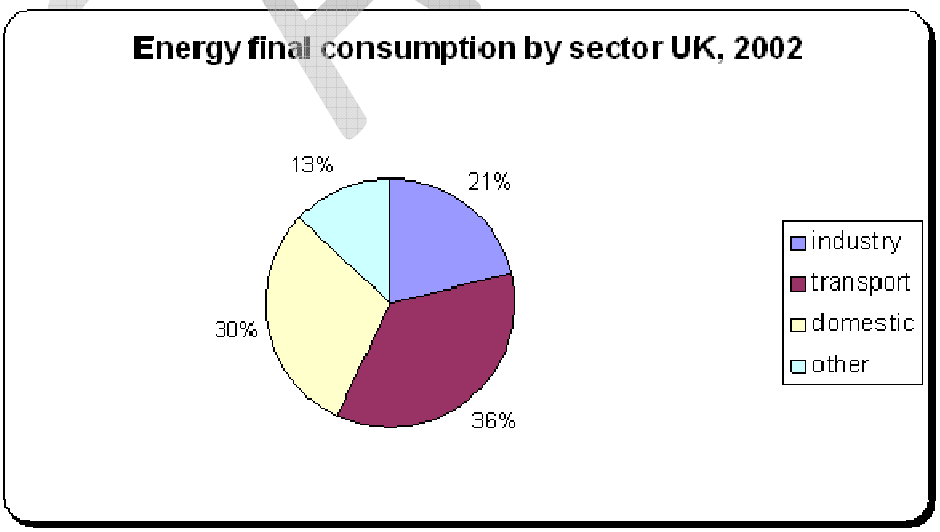
2.1 Different Types of Energy

Energy plays an indispensable role in modern society. We all depend on a constant and reliable supply of energy - for our homes, businesses and for transport.

The majority of the UK's energy comes from burning fossil fuels (e.g. coal, oil and gas). However, the mix of fuel sources has changed significantly in the last 50 years. In 1950, about 90% of our energy came from coal; but today, coal accounts for only about 15%. Gas now provides a large proportion, with oil and nuclear sources making up the rest, and renewable energy accounting for only about 3%.

Increasingly we are learning how to use natural and renewable sources of energy such as sunlight, water, wind and crops to meet these needs. We remain, however, heavily reliant on fossil fuels which, when burnt, release greenhouse gases.

In the future, the amount and proportion of renewable energy generated is set to rise largely because of government policy and programmes to support renewable energy generation.



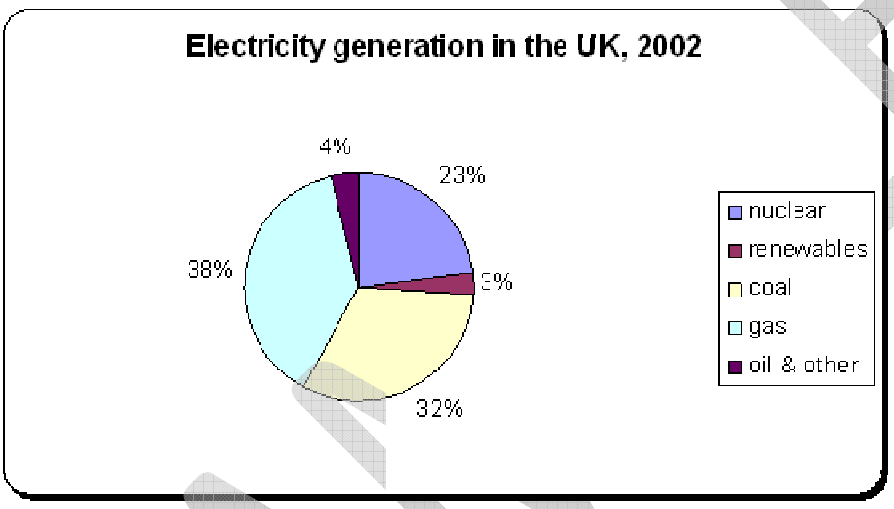
Source: Department of Trade and Industry

Types of Energy

There are two main types of energy:

- **Renewable** energy
    - Utilises natural resources such as sunlight, wind, tides and geothermal heat, which are naturally replenished
- **Non renewable** energy
    - Utilises sources that come out of the ground, such as solids, liquids, and gases in the form of coal, oil and natural gas

Electricity



Source: Department of Trade and Industry

Electricity is one of our most widely used forms of energy; it is a secondary energy source, which means that we get it from the conversion of other sources of energy, like coal, natural gas, oil, or nuclear power. Most of our electricity is generated in large power stations.

Electricity is a controllable and convenient form of energy used in the applications of heat, light and power. Despite its great importance in our daily lives, most of us tend to take electricity for granted and rarely stop to think what life would be like without it.

Our reliance on depleting, non-renewable fossil fuels means that eventually these types of fuels will run out and the power plants will close, so it is vital that new forms of energy, i.e. renewable energy, are found and utilised -.

Gas

Natural gas is a vital component of the world's supply of energy. Natural gas is a colourless and odourless fossil fuel and is an efficient form of energy that burns more cleanly, releasing fewer pollutants into the atmosphere than oil or coal.

Natural gas is generally found deep underground, near coal seams or oil fields. It consists mainly of methane, a hydrocarbon that is lighter than air; other compounds include ethane, propane, and butane.

Natural gas has many uses both domestically and in industry. Britain was the first country to commercialise the use of natural gas. Around 1785, natural gas produced from coal was used to light houses as well as streetlights.

There has been a huge rush in recent years to build gas-fired power stations as, unlike coal and oil stations which have to produce steam to turn turbines, gas can be used to directly turn the turbines. The exhaust heat is then captured and reused to produce steam for further power production. This technology can increase the efficiency of a fossil fuel from about 40% average to 80%.

The advantages of using gas are that it is light and easy to transport by pipeline and large amounts of electricity can be generated from one gas-fired power station.

The disadvantages include that burning gas contributes to the greenhouse effect by producing carbon dioxide; also, it is not renewable and there is a limited supply, which will eventually be used up.

Oil

Oil is a liquid fossil fuel, which was formed millions of years ago by dead organic material building up on ocean floors, riverbeds and swamps.

Thousands of years ago people found oil bubbling up to the surface in certain places around the world. This substance was used as a medicine, for lighting and even as a weapon.

However it wasn't until the 19th Century that people began systematically looking for oil, initially using it primarily to extract kerosene for lighting and then petrol and diesel for fuel.

Today, hundreds of thousands of oil wells around the world extract oil from under the ground.

Transport dominates the UK's use of oil, with 74% of supply used to power the cars, planes, buses, trains and lorries that we depend upon.

Oil is also used to create electricity. Like coal, it is burned to heat water, producing steam, which in turn spins the blades of turbines that are connected to generators.

Advantages of using oil are that it is easy to transport by pipeline or ship, and large amounts of electricity can be generated from one power station quickly.

Disadvantages of using oil are that oil is not renewable; the world's supply of oil is running out quickly, and using oil is very expensive compared to coal and gas.

Coal

Coal is a fossil fuel found in the Earth's crust and was formed around 300 million years ago when the world was covered with tropical forest. There was not much oxygen and bacteria that would normally rot the plants could not do so. In swampy places, plants died and fell into the water and mud. The plants and wood physically and chemically changed into coal over millions of years.

The major producers of coal are:

- India
- Wales
- Scotland
- Northern England.
- China
- USA
- South Africa
- Australia
- Russia
- Poland
- Columbia
- the Ukraine

Coal is a fuel used in many power stations. When it burns, it releases a great deal of heat, making it a useful source of energy. The burning coal heats water, which produces steam, which then pushes against the blades of turbines, causing them to spin. The turbines are connected to generators, which create electricity.
The biggest advantage of coal is that it is far more abundant than oil and gas and using it is one of the cheapest ways of producing power at the moment.

The disadvantage of using coal is that it is one of the dirtiest of fuels. Burning it produces enormous amounts of ash and flue gasses containing pollutants such as sulphur dioxide (a gas found in acid rain), nitrogen oxides, sulphuric acids and arsenic, all of which contribute to the greenhouse effect. It also produces almost twice as much carbon dioxide as gas (for the same heat). Also, there are limited supplies which will run out one day.

There is also the environmental and human cost of extracting the coal: subsidence, spoil heaps, miners' deaths and illnesses. As it is used up, the remaining reserves will be even harder to mine.

Uses of Energy

Energy use has increased significantly since the start of the industrial revolution. This is due to increases in the human population, increased production of consumer goods, and increasing use of energy-intensive appliances such as washing machines, televisions and cars.

For transport, we currently rely almost entirely on oil in the form of petrol or diesel.

Heat is generated mainly from gas, but we also use electric heaters and burn small amounts of oil, coal and other natural substances.

For lighting and the powering of appliances, we use electricity.

Sources of Energy

We can get our energy from various sources:

The National Grid

The national grid is a network of high-voltage electric power lines linking major power stations throughout the United Kingdom. The national grid is required to maintain stability within specified standards of frequency and voltage.

Mains/Gas Tanks

Gas is pumped into our homes and businesses usually through mains pipes, but more rural areas typically have LPG gas supplied in a tank or in gas bottles that are stored outside in the garden.

Alternative Sources of Energy

Whilst there are a range of energy sources, the way we use energy 'the end product' is usually for one of three categories:

- Production of electricity
- Generation of heat
- Energy for transport

Renewable energy comes from sources that are essentially inexhaustible. They include the sun, the wind, flowing water and the heat of the Earth; or replaceable fuels such as those derived from plants. Renewable energy can be used to satisfy all of the above needs.

Wind Power

People have used the power of the wind for many years to produce mechanical power for milling grain and pumping water. In recent times, wind turbine technology has enabled us to harness wind to generate electricity; the electricity is then exported to the national grid for local use.

Wind turbines are moved by the wind and convert this kinetic energy directly into electricity by spinning a generator.

Wind resources are best along coastlines and on hills, but usable wind resources can be found in most other areas as well.

On days when there is no wind blowing, the required electricity has to be generated by non-wind power stations, so even when we have a lot of wind turbines we will also still need all the existing power stations. This is broadly correct, although the days when there is no wind across the entire UK are extremely rare.

UNIT 2: Managing Energy Usage

Activity 9

Identify different types of energy in the UK and describe the sources and uses of these different types of energy.

Type	Source	Uses

Activity 10

Identify the types of energy used in your workplace and who the supplier is, and describe what each type of energy is used for

Type	Supplier	Uses

Activity 11

Describe the environmental costs of different types of energy usage.

Type of Energy	Costs to the Environment