



Introduction to renewable energy: 11- to 14-year-olds

How much energy do you use?

Think of all the switches you flick, the buttons you press, the machines you use – and then include the boiler...and the car engine. Make a list of all the energy you have used in the last 24 hours – it will take quite a while. Light, heat and transport all use energy and most of that energy comes from oil, coal and gas.

Where does energy come from?

The electricity that powers our homes comes mainly from power stations that burn coal and gas. Our cars use petrol and diesel, which come from oil.

Coal, oil and gas are called fossil fuels. They are buried deep under the land and seas and take millions of years to form. The fossil fuels we use now were probably formed before the time of the dinosaurs. Most fossil fuels started life as plants and animals during the Carboniferous Period, about 360 to 286 million years ago. 'Carboniferous' gets its name from carbon, the basic element in coal and other fossil fuels.

THREE reasons to switch to different kinds of energy

- **ONE: Fossil fuels will not last forever.** If we keep using up fossil fuels at the same rate we are using them today, we might use up all the world's coal reserves in 200 years, all the world's natural gas reserves in 60 years and all the world's oil reserves in 40 years.

But will we keep using fossil fuels at the same rate? The world is growing, both in population and in industrial expansion, and we are using more and more energy as we grow.

China is a good example of this huge industrial expansion. In 2004, China became the world's second-largest consumer of energy. China once exported oil. Not any more. It needs all of its oil reserves – and more – to provide fuel for its growing economy.



- **TWO: Burning fossil fuels causes pollution and global warming.** When power stations burn coal, oil and gas to create electricity, a gas called carbon dioxide (CO₂) is released into the air. If there is too much CO₂ in the air, it stops heat escaping from the atmosphere, just like in a greenhouse. CO₂ is one of the main 'greenhouse gases' that most scientists believe is causing global warming. We can slow down global warming if we use fossil fuels more carefully and use other kinds of energy that don't pollute the environment.
- **THREE: To protect our energy supplies for the future.** For the last 30 years we have relied on the North Sea oilfields for our energy supplies. In future we will have to import more oil and gas. In the UK, we need to reduce our need to import energy from other countries and try to develop our own energy resources.

Other sources of energy

The good news is that alternative sources of energy do exist. Did you know we can use the power of the sun, wind and water, and the heat from the ground, to meet some of our energy needs? There are also some hi-tech solutions such as fuel cell technology.

Natural sources of energy like these are called 'renewable' energy sources, because they won't run out. One advantage of using renewable energy sources is that they are clean. That means they produce little or no pollution.

Renewable energy in Britain

At the moment Britain gets very little of its energy requirement from renewable sources – just 3 per cent. But the government would like this to grow and there is a target to produce 10 per cent of our energy needs from renewable sources by 2010.



Introduction to renewable energy: 14- to 16-year-olds

Energy – how much do you use and where does it come from?

Think of all machines, gadgets and gizmos that you use each day. Make a list – from the electric toothbrush to the SUV – it will take quite a while.

The electricity that powers our homes comes mainly from power stations that burn coal and gas. Our cars use petrol and diesel, refined from oil. Coal, oil and gas are fossil fuels and were formed 360 to 286 million years ago during the Carboniferous Period.

THREE reasons to switch to different kinds of energy

■ **ONE: Fossil fuels will not last forever.** At the current rate of use, it's thought that the world's coal reserves will last for only another 200 years, world natural gas reserves for about 60 years, and world oil reserves for just 40 years. But no-one can be sure just how long our fossil fuels will last because we are using more and more energy.

In 1950 the world's population was 2.5 billion. Twenty years later it was 3.7 billion. The latest figures put the total at 6.2 billion. More people use more energy. In MEDCs (more economically developed countries – such as Britain and the USA), energy use is increasing as greater wealth allows people to buy more products. The average family now uses two cars. In LEDCs (less economically developed countries – such as India and Nigeria), demand for energy is rising as industry expands.

China is a good example of this huge industrial expansion. In 2004, China became the world's second-largest consumer of energy. Its economy has expanded by an average of nine per cent a year for the last two decades, leading to a huge demand for energy.

■ **TWO: Burning fossil fuels causes pollution and global warming.** When power stations burn fossil fuels to create electricity, waste gases, including carbon dioxide (CO₂), are released into the atmosphere. Too much CO₂ in the air prevents heat escaping from the atmosphere. CO₂ is one of the main 'greenhouse gases' that many scientists believe is causing global warming. Global warming could be the biggest problem the human race has ever faced.



Increasing temperatures could make life on earth impossible. Climate change is expected to give rise to numerous impacts, most of them negative, over the next 100 years. Sea levels will rise, increasing the risk of flooding in coastal areas. Warmer temperatures and shifting patterns of rainfall will force changes in agriculture. Some areas will experience water shortages and others will become more flood-prone.

In 1997, worries about climate change led 119 countries to sign an agreement – the Kyoto Protocol – which set targets for the reduction of greenhouse gas emissions. However, if we are not to use fossil fuels for our energy, we need to find alternatives.

■ **THREE: To protect our energy supplies for the future.**

A third issue to consider is energy self-sufficiency. For the last 30 years we have relied on the North Sea oilfields. In future we will have to import more oil and gas from other countries. As a country, we need to reduce our need for energy imports and try to develop home-grown energy resources.

The good news is that alternative sources of energy do exist. People have been using them for thousands of years. Natural energy sources include wind and water power, wood for fuel, power from the sea, and heat from the ground. Added to these are some hi-tech solutions like solar energy and fuel cell technology. Unlike fossil fuels, which are non-renewable, these energy sources are renewable – they won't run out.

Renewable energy sources are preferable because they are both clean and sustainable: clean because they produce little or no pollution, and sustainable because the energy comes from naturally renewable sources such as the wind and the tides.

Renewable energy in Britain

At the moment Britain gets very little of its energy requirement from renewable sources – just 3 per cent. But the government would like this to grow and there is a target to produce 10 per cent of our energy needs from renewable sources by 2010.

Britain is fortunate: as a result of our position on the edge of a continental landmass, we are the windiest country in Europe. There is a huge potential for wave and tidal energy. As a developed country we are also well placed to develop hi-tech solutions such as photovoltaic (PV) technologies and fuel cells.



Introduction to renewable energy: 16- to 18-year-olds

Fossil fuels will not last forever. At the current rate of use, the best guess is that world coal reserves will last for about 200 years, world natural gas reserves for about 60 years and world oil reserves for just about 40 years. But no-one can be sure of the true situation because demand for energy is increasing year by year.

In 1950 the world's population was 2.5 billion. Twenty years later it was 3.7 billion. The latest figures put the total at 6.2 billion.

More people use more energy. In MEDCs (more economically developed countries – such as Britain and the USA), energy use is increasing as greater wealth allows people to buy more products. The average family now uses two cars. In 1950, few people could afford one. In LEDCs (less economically developed countries – such as India and Nigeria), demand for energy is rising as those countries industrialise.

China is a good example of this huge **industrial expansion**. In 2004, China became the world's second largest consumer of energy, forcing Japan into third place. China has reserves of oil and natural gas and once exported an oil surplus. Not any more. Its economy has expanded by an average of nine per cent a year for the last two decades, leading to a huge demand for energy.

That's one very good reason to look for other fuels and energy sources, but it's not the only one. Burning fossil fuels causes pollution and releases carbon dioxide into the atmosphere. CO₂ is one of the main 'greenhouse gases' contributing to **global warming**, rated as one of the biggest problems the human race has ever faced.

Climate change is expected to give rise to numerous impacts, most of them negative, over the next 100 years. Sea levels will rise, increasing the risk of flooding in coastal areas. Warmer temperatures and shifting patterns of rainfall will force changes in agriculture. Some areas will experience water shortages and others will become more flood-prone.

Added to the equation is the **politics of development**.

Developing countries resent being told to restrict their industrial development. They are fully aware of the potential pollution and the associated effects such as acid rain and deforestation. But who, they ask, will bear the cost of environmental protection?



This was the background to the Kyoto Protocol, signed by 119 countries in 1997. Kyoto set targets for the reduction of greenhouse gas emissions but left many questions unanswered, not least because the United States has yet to sign the agreement.

A third problem affecting Britain is the question of energy strategy. For the last 30 years we have relied on the North Sea oilfields. In future we will have to import energy, often from politically unstable countries. This creates an urgent need to develop UK-based generating capacity that does not rely on imported fuels.

The good news is that alternative sources of energy do exist, from wind turbines to tidal energy projects. Added to these are some hi-tech solutions, such as solar energy and fuel cell technology. Renewable energy sources are preferable because they offer a clean and sustainable future: clean because they produce little or no pollution, and sustainable because the energy comes from naturally renewable sources.

At the moment Britain gets very little of its energy requirement from renewable sources – just 3 per cent. But the government policy is to grow this figure to 10 per cent by 2010.

Britain is fortunate. As a result of our position on the edge of a continental landmass, with an ocean as a neighbour, we are the windiest country in Europe. There is a huge potential for wave and tidal energy. As a developed country we are also well placed to develop hi-tech solutions such as photovoltaic (PV) technologies and fuel cells.