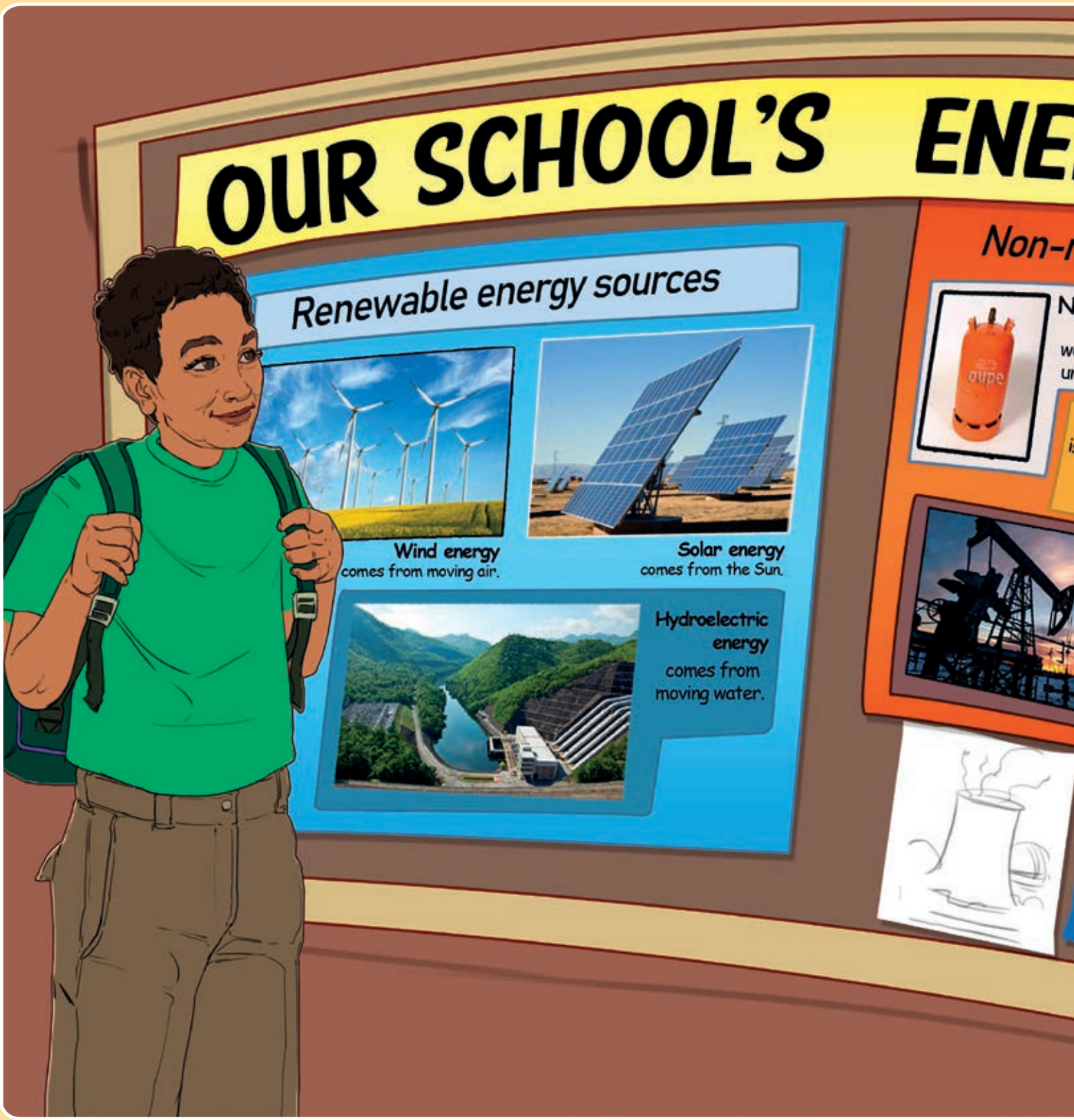
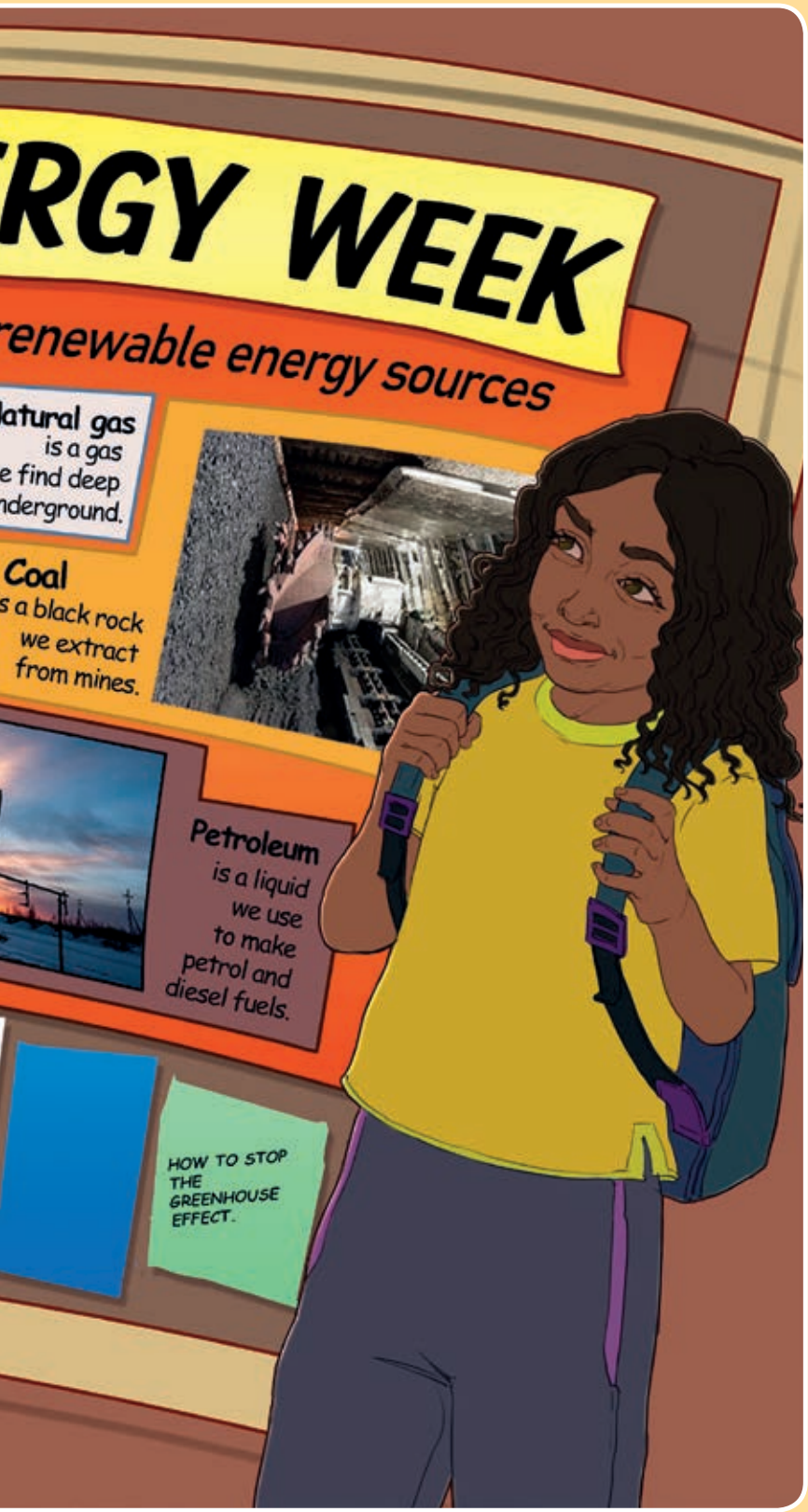
Unit 2 Energy

1 Watch. How do we use fossil fuels?





Let's learn about ...

- forms of energy
- renewable energy
- non-renewable energy
- the effect of energy on our planet

2 **Look at the school notice board and answer the questions.**

a. Where do we get hydroelectric energy from?

b. What do we use petroleum for?

c. Where do we find coal?

3 **Work in pairs. Answer the questions.**

a. What do you think is the best source of energy? Why?

b. Where have you seen renewable energy sources?

c. What do you use non-renewable energy sources for?

d. How can you save energy in your daily life?

e. What do you know about the climate crisis?

Be mindful

What three things are you thankful for that use energy?

Listen to the examples. 005

What is energy?

Energy makes things happen. There are many forms of energy.

1 **Look at the picture. What forms of energy can you see?** ▶ **Watch.**

- chemical energy
- electrical energy
- mechanical energy
- nuclear energy
- radiant energy
- sound energy
- thermal energy

Clue: There are two examples of mechanical energy.

Mechanical energy

Mechanical energy = potential energy + kinetic energy

A moving object has **kinetic energy**. An object at a height has **potential energy**, or stored energy. When an object **moves**, this potential energy will be converted into kinetic energy.

2 **Do the balloon experiment to learn about mechanical energy.**

Step 1.

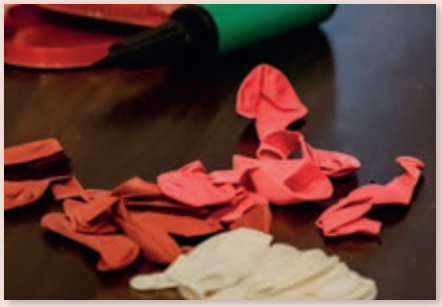
Inflate a balloon. You can use a pump or blow it up with your mouth.

Step 2.

Pinch the end shut with your fingers, to stop the air from escaping. What kind of energy does the balloon have?

Step 3.

Let the air out. What happens? What kind of energy is this?



Electrical energy

Electrical energy is the movement of **small charged particles** called electrons. We generate electricity from other forms of energy in **power stations**. Electricity travels through power lines and cables.

3 **Listen to this advert. Name the electrical devices you remember.** 006

Chemical energy

Energy stored in chemical compounds is called chemical energy. Chemical energy is released in a chemical reaction.

4 **Write the name of each example of chemical energy in your notebook.**

a. 

b. 

c. 

Sound energy

When objects vibrate they cause **particles** in the air, a liquid, or a solid object to **vibrate**. This produces energy that travels in waves to your ear. When these waves reach your eardrums, they start to vibrate too, which you hear as a sound.

5 **Use the Internet to answer the questions.**

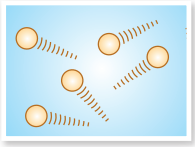
a. Does sound travel faster in the air, a liquid or a solid object? Explain your answer.

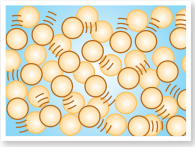
b. Why can't sound travel through a vacuum?

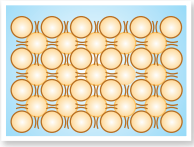
Thermal energy

Thermal energy is also known as heat energy. Hot things have more energy than cold things because the particles inside them are moving around faster.

6 **What state of water can you see in each picture? Explain your answers in your notebook.**

a. 

b. 

c. 

WOW

It takes years for the light from stars to reach the Earth. This means that when you look at a star, you are actually seeing what it looked like years ago.

Radiant energy

Radiant energy is energy in the form of **electromagnetic waves**. Light is an example of radiant energy.

7 **Write three reasons why radiant energy is important for plants.**

At home Write examples of five different forms of energy in your kitchen.

How do we use different forms of energy?

Energy can **transform** into a different form of energy. This happens all the time when we use energy. The **law of conservation of energy** states that energy can't be created or destroyed.

Transforming chemical energy

We convert the chemical energy from **fuel** and **petrol** into different forms of energy. Cars and planes transform chemical energy from fuel into mechanical energy so they can move and take us to different places. In winter, many people use gas heaters in their homes to keep them warm. Gas heaters transform chemical energy into thermal energy.

1 **Copy and complete the sentences in your notebook.**

a. A torch converts _____ energy from the battery into _____ energy.

b. Your muscles convert _____ energy from food into _____ energy.

c. A leaf converts _____ energy from the Sun into _____ energy.

Calories measure the chemical energy stored in food and drink. The more calories the food has, the more energy it contains.

Nuts, cheese and red meat, such as beef and pork, have a lot of calories. Vegetables and white meat, such as chicken and pork or fish, have fewer calories.

The food we eat contains chemical energy. When we eat, our body can transform this chemical energy into heat energy or into the movement of our muscles.

2 **Read and say *True* or *False*. Correct the false sentences in your notebook.**

a. Broccoli has more calories than beef.

b. People get calories from the food they eat.

3 **Work in pairs. Answer the question. How do you feel when you haven't eaten for a few hours?**

Transforming electrical energy

There are probably a lot of different electrical appliances in your home. Energy can be transferred from one object to another and energy can also be converted into different forms. For example, when you turn a light on, it converts electrical energy into light and heat energy.

4 **Copy and complete the table in your notebook.**

Device	Energy transformation

a. 

b. 

c. 

d. 

e. 

f. 

Transforming radiant energy

The Sun produces radiant energy which we see as light. Plants absorb radiant energy and transform it into useful chemical energy. Animals can obtain some of this chemical energy as food by eating plants, or by eating animals which eat other animals or plants. The biomass created by plants can also be used in biofuels.

5 **Write the sentences in the correct order in your notebook.**

a. Solar panels absorb the energy.
b. The energy is transformed into electricity.
c. The electricity is used to power the appliances in your home.
d. The Sun shines.

At home

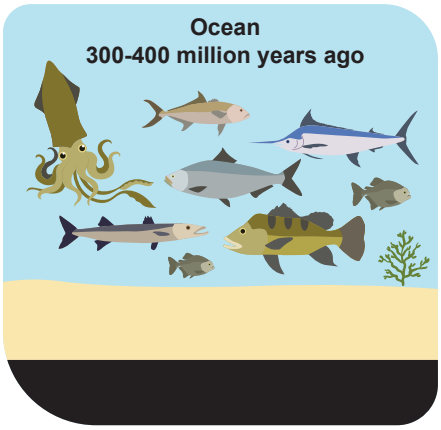
Find a device in your home that converts electrical energy into mechanical energy.

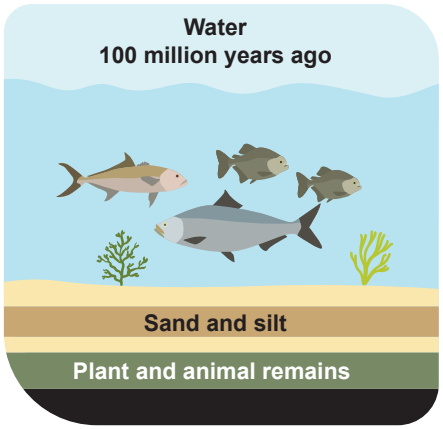
Where do non-renewable resources come from?

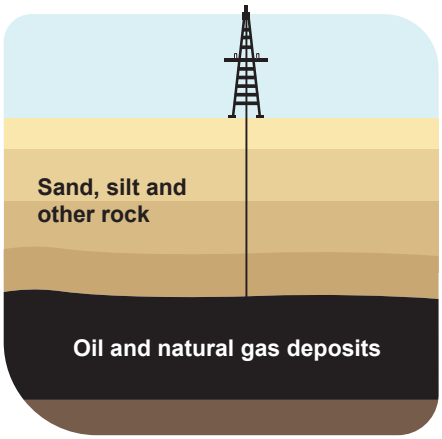
Non-renewable energy sources include **petroleum**, **natural gas**, **coal** and **uranium**. Once we use these energy sources they cannot be replaced.

Fossil fuels

Fossil fuels formed from plants and trees. These plants and trees lived millions of years ago. Sand and rocks covered the remains of animals and plants. **Heat** and **pressure** transformed them into petroleum, natural gas and coal.







1 **Read and say *True* or *False*. Correct the false sentences in your notebook.**

a. Fossil fuels formed from plants and animals. These plants and animals lived thousands of years ago.

b. The remains of plants and animals became petroleum, coal and natural gas.

c. Fossil fuels are an unlimited resource.

How do we use fossil fuels?

Natural gas can be used for heating and cooking in homes.

It can also be used to generate electricity in power plants.

Using natural gas causes less pollution than burning coal or oil.

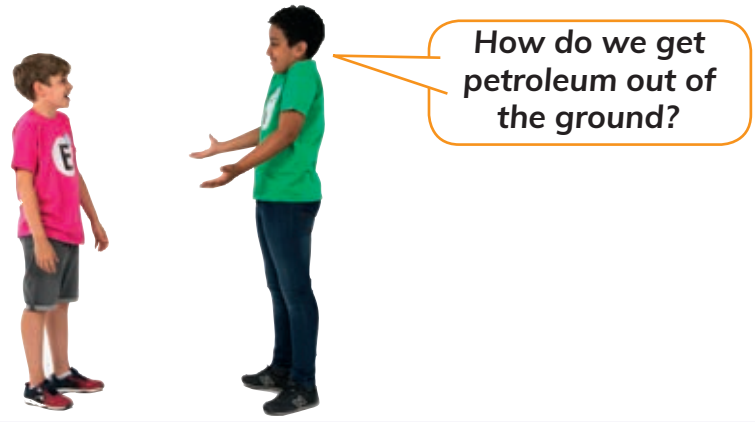
2 **Which energy source does your school use for heating and cooking?**

A major source of fuel throughout the world is coal. **Coal** is a rock made from carbon. We extract coal from mines that are **underground**.

Coal is used to produce electricity in power plants.

Petroleum is a black liquid which formed from decaying animals and plants. We use petroleum in petrol, diesel and other fuels. It's also used to make roads and produce plastic products

3 **How do we extract fossil fuels? Research on the Internet.**



Nuclear Energy

We use **uranium** to produce nuclear energy. Nuclear power stations convert nuclear power into electrical energy. The uranium on Earth was formed 6.6 billion years ago in one or more stellar explosions. Uranium stores huge amounts of energy. Nuclear energy produces radioactive waste which remains dangerous for thousands of years.

4 **Write two interesting facts about nuclear energy in your notebook.**

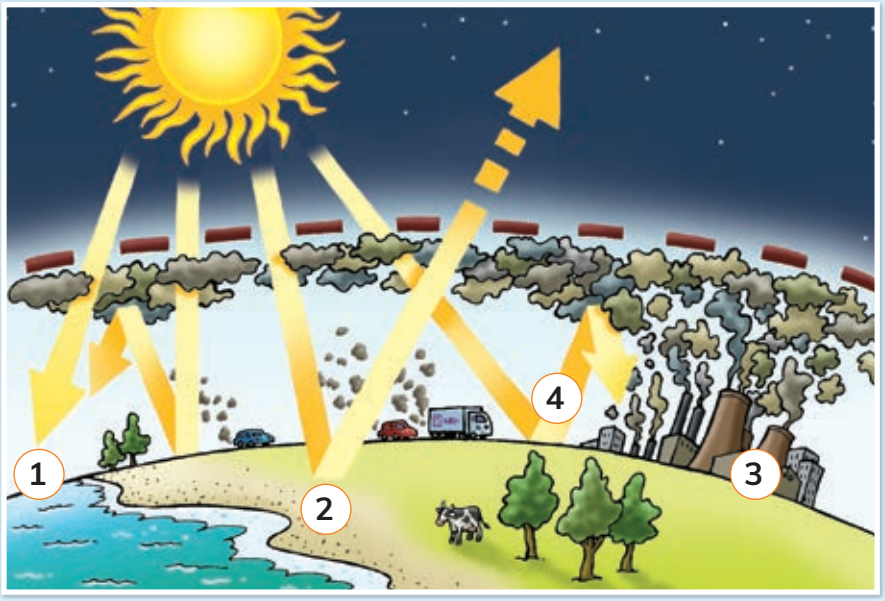
At home

Think of two ways you have used non-renewable energy sources this morning.

What are the negative effects of fossil fuels?

Non-renewable energy causes **air** pollution, **water pollution** and **land pollution**. When we burn fossil fuels we pollute the atmosphere with greenhouse gases, such as carbon dioxide, methane and nitrous oxide. This is the main cause of the climate crisis.

The greenhouse effect



The greenhouse effect is when gases, such as **carbon dioxide**, in the Earth's **atmosphere** store **heat** from the Sun. These gases are called greenhouse gases.

The greenhouse effect makes the Earth warmer than it would be without an **atmosphere** and makes the Earth a comfortable place to live.

1 **Read the sentences and choose the correct number in the picture.**

a. The Earth reflects some heat back into space.

b. Radiant energy from the Sun enters the Earth's atmosphere and warms the Earth.

c. Some of the heat can't pass through the greenhouse gases and returns to the Earth's surface. This makes the Earth warmer.

d. Burning fossil fuels for transport, power plants and our homes, puts more carbon dioxide into the atmosphere.

Consequences of the climate crisis

2 **Look at the photos. What climate crisis are they showing? Discuss with a classmate.**

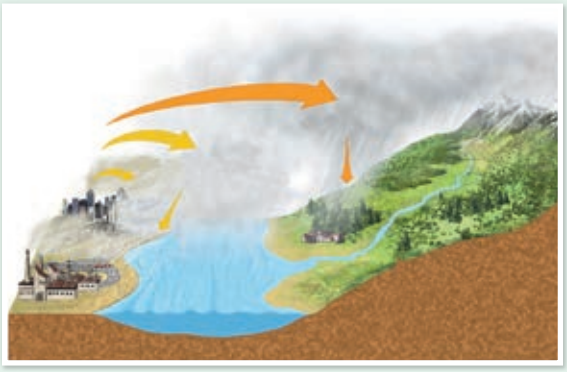
a. Hurricanes will become more powerful.

b. Heatwaves will cause dangerously hot weather and droughts may reduce food production.

c. Heavy rain will cause more floods.

d. Loss of habitats such as rainforests.

Acid rain



Acid rain is caused by **sulphur** dioxide and **nitrogen oxides** in the atmosphere as a result of burning fossil fuels. These gases combine with oxygen and water in the air to form acid rains that falls to Earth as precipitation. Acid rain pollutes the air, water and land.

3 **Answer the questions in your notebook.**

a. What are the names of the pollutant gases?

b. Where do these gases come from?

c. What different types of pollution does acid rain generate?

4 **Listen to the news broadcast. Work in pairs. Describe what is happening.** 007

Ocean acidification

Oceans are absorbing more carbon dioxide, so they are becoming more acidic.

This is harmful for many ocean species. The increase in carbon dioxide is damaging coral reefs and dissolving the shells of sea snails and mussels. This will affect other species that depend on these animals for food.

5 **Read and say *True* or *False*. Correct the false sentences in your notebook.**

a. Ocean acidification only affects sea snails and mussels.

b. Ocean acidification is mainly caused by carbon dioxide dissolving in the ocean.

c. Human activities cause ocean acidification.

At home

Write five ways to reduce the amount of energy you use in your home.

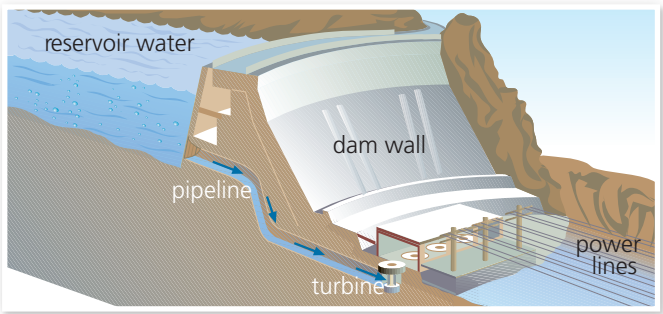
What are the advantages of renewable energy?

Renewable energy sources are unlimited resources, meaning we can use them repeatedly. Renewable energy sources are better for the environment. We call them clean energy resources because they produce **less pollution**.

1 Watch. **What do people have to do to protect the environment?**

Hydroelectric energy

1. We store water in reservoirs. The water in the reservoir has potential energy.
2. The water falls down water pipes. The falling water has kinetic energy.
3. The water moves the turbine in the hydroelectric plant and the kinetic energy is transformed into electrical energy.
4. Some of the water evaporates and forms clouds.
5. The water falls back down to Earth as rain and flows into the reservoir.



2 **Think of one advantage and one disadvantage of hydroelectric energy.**

Solar energy

Solar energy comes from the Sun. The Sun gives us light and heat. We can use solar panels to transform this energy into electrical energy.

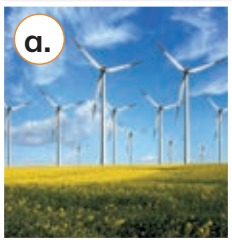
A lot of countries are investing in solar power plants today. This is a photo of the Noor solar power plant in Ouarzazate, Morocco. It will provide about 40% of the electricity the country needs.

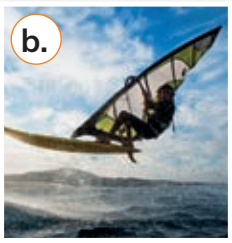
3 **Investigate. Where is the nearest solar power plant to your house?**

Wind energy

We can't see the air, but we can see wind energy in action.

4 **Name the examples of wind energy in your notebook. Which of them can power our homes?**





5 **Copy and complete the sentences in your notebook.**

a. The windmills of the past converted wind energy into _____ energy.

b. The wind turbines of today convert wind energy into _____ energy.

Biofuels

Biofuels come from plants or animal waste products. Biofuels can be biomass, which is solid, bioliquids or biogases. Biofuels produce some greenhouse gases, so we shouldn't clear rainforests to grow biofuel crops.

wood pellets

biodiesel

biogas

6 **Work in pairs. What type of biofules are wood pellets?**

Tidal energy is produced by converting the movement of the ocean tides into electrical energy. Turbines and paddles are used to do this.

Geothermal energy works by using the heat from deep inside the Earth to heat water and make steam. The steam is then used to make electricity.

7 **Which type of renewable energy is best for Spain? Why?**

At home Do you use any renewable energy sources at home?

Science lab

How does acid rain affect plants?

When factories and power stations burn non-renewable sources of energy, they emit pollutant gases. These gases mix with the water in clouds and form acid rain.

We can simulate acid rain using vinegar and water, as vinegar is an acid.

Hypotheses

What do you think will happen? Write your hypothesis.

Materials

- 2 labels
- 2 plants
- 2 spray bottles
- a measuring jug
- a pen
- stickers
- vinegar
- water

Step 1

Fill one spray bottle with 400 ml of water. Write and stick a label on the bottle: *1. Water*

Step 2

Fill the other spray bottle with 200 ml of vinegar and 200 ml of water. Write and stick a label on the bottle: *2. Vinegar and water*

Step 3

Put stickers on the plants: A and B. Put the plants in a sunny place. Once a day spray plant A with the water and spray plant B with the vinegar and water solution.

Step 4

Take a look at the plants every day and write notes.

Results

Watch. Compare your results with a classmate. Fill in the worksheet.

Tip 1

Using synonyms

A synonym is a word that means the same as another word. Using synonyms makes your writing more interesting and expands your vocabulary.

1 **Copy the sentences and change the word in bold for a synonym.**

a. Cars **convert** chemical energy into mechanical energy.
b. Nuts **contain** more calories than carrots.
c. We use coal to **produce** electricity.
d. The food we **consume** contains chemical energy.
e. Radiant energy **warms** the Earth.

Tip 2

Using relative pronouns

We use relative pronouns to make it clear which person or thing we are talking about.

2 **Rewrite these sentences using the pronoun *which*.**

a. Sound waves reach our eardrums. This makes our eardrums vibrate.
b. Our homes have electrical appliances. These appliances convert electrical energy into other forms of energy.
c. The Sun produces radiant energy. This energy comes to Earth as light.

Tip 3

Using a vocabulary word map

In this unit the words in **orange** are key words.

3 **Choose three key words and copy and complete the vocabulary word map for your chosen words.**

Word	Definition
Picture	Example

Story

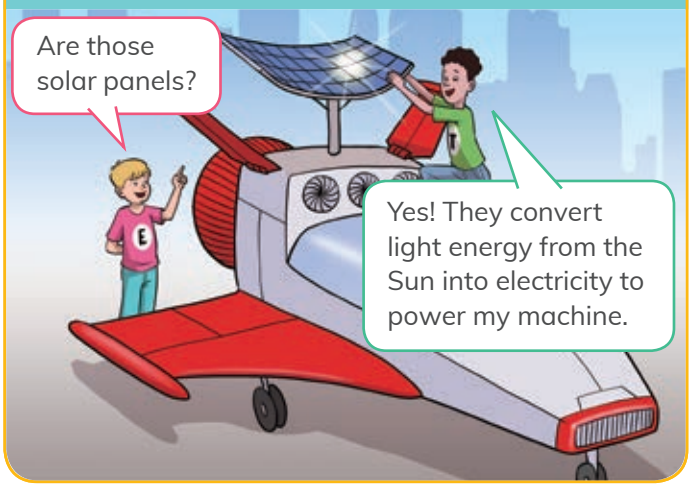
1 Read and listen. 008

2 Find the words in the story. Write definitions in your notebook.

biofuel | reservoir | solar panels | turbines

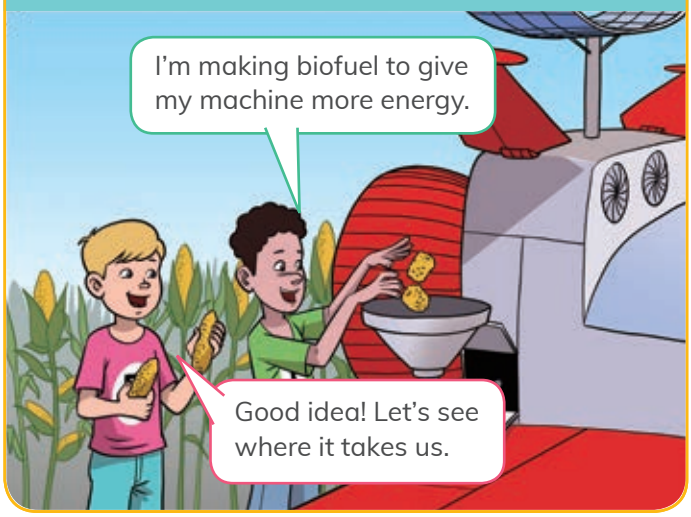
Back to the future

Solar energy is a renewable energy source. Energy from the Sun is converted into electricity.



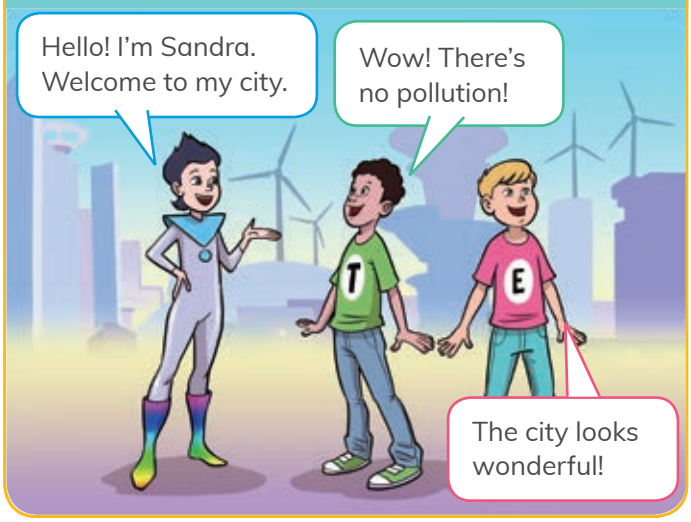
Energy from non-renewable energy sources is used to power cars and heat our homes. However, the burning of fossil fuels is one of the leading causes of global warming.

We can make biofuels from plants and animal waste.

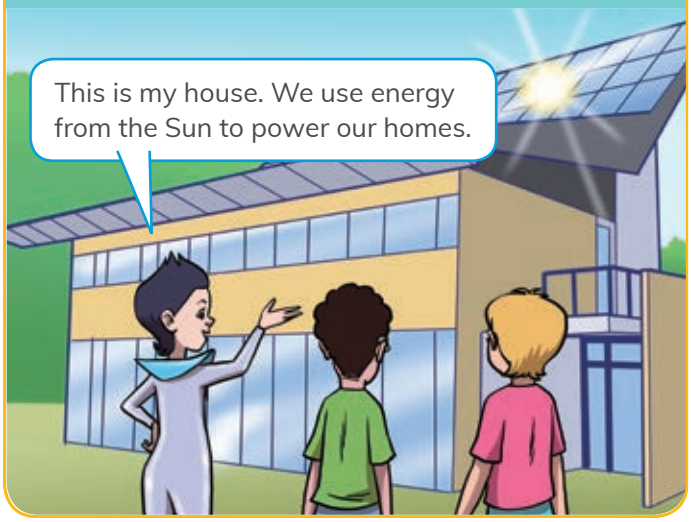


It's vital for our future that we use renewable energy.

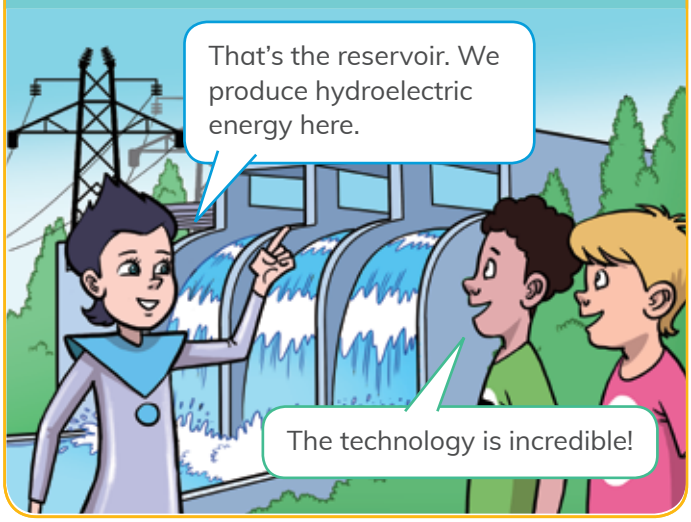
Kinetic energy from the wind turns turbines and produces energy that powers our homes.



Solar panels work even when it's not sunny. Batteries store the energy so we can use it later.



Hydroelectric energy is electricity that is produced when water pushes against a turbine.



Sustainable development using renewable energy sources can help protect our planet from the climate crisis.

3 **Read and say *True* or *False*. Correct the false sentences in your notebook.**

a. Solar energy is a non-renewable energy source.
b. Petroleum is a fossil fuel.
c. We can make biofuels from metals and stones.
d. The kinetic energy in the wind can produce electricity.
e. Hydroelectric energy is produced by water.
f. In sustainable development, renewable energy sources are not used.

CULTURE

Donna Strickland (1959)

Donna Strickland is a physicist from Canada. She was born in Guelph, Ontario in 1959. Her mother was a teacher and her father was an electrical engineer.

She studied engineering physics at university and was particularly interested in lasers and electro-optics. She did her doctoral research in the Laboratory for Laser Energetics in the United States.

Donna Strickland improved **laser** technology to develop a much more precise cutting tool. This is very useful for surgeons as it helps make many operations safer for patients. Donna Strickland's work has allowed doctors to carry out millions of successful corrective eye surgeries.

Her technology has also helped dentists treat tooth problems, surgeons to remove tattoos, and artists to draw and write pictures and words on objects of many different kinds.

Donna Strickland and her colleague Gérard Mourou won the Nobel Prize for Physics in 2018.

1 **Answer the questions.**

a. Where's Donna Strickland from?
b. What did her mother do?
c. Why was her work important?
d. When did she get a Nobel Prize?

WebQuest

2 **Do the WebQuest. Do you know Elon Musk? Answer the questions in your notebook.**

a. Who is Elon Musk?
b. When was he born?
c. Where was he born?
d. Elon Musk is the CEO of which company?
e. What does the company do?

Challenge

Saving energy leaflet

Before you start

1 Listen to the podcast. What important information does Shui give? 009

I'm making a leaflet on how to save energy at school.

You need ...

- a pencil
- coloured pencils
- paper

Planning

2 Read Shui's leaflet. In groups, make stickers of her tips to put around your school.

My useful tips

By Shui

In my school we use a large amount of energy, and we waste a lot too. We must think about how we can stop wasting energy in class. For example, we waste energy by leaving the lights on even when we are in the playground.

We also leave the heating on in the winter and the air conditioning on in the summer.

Here are my tips for saving energy:

Tip 1: Let's turn off the lights when we leave the room. I volunteer to leave the room last every day and turn off the lights.

Tip 2: We should keep the door of the classroom closed. This keeps the room warm in winter and saves on the heating.

Tip 3: I suggest that we start using solar panels to generate electricity. In Spain, there are a lot of sunny days!

Tip 4: Don't put the heating or the air conditioning on too high.

Tip 5: Let's use energy efficient LED light bulbs. They consume much less energy than a normal bulb. LED bulbs are a bit more expensive, but they save money because they last much longer.

3 Talk to a classmate.

a. What's the purpose of Shui's leaflet?
b. What information does she include?
c. What do you like about Shui's leaflet?
d. How could you improve Shui's leaflet?

4 Create a leaflet or podcast about saving energy.

5 Share your project with your classmates.

6 Give your classmates constructive feedback.

Review

1 **Work in pairs.**

a. Name three examples of renewable energy sources.
b. Name three examples of non-renewable energy sources.
c. How's hydroelectric energy produced?
d. What do wind turbines convert the kinetic energy in the wind into?
e. Where do we get biofuels from?
f. What will happen if we continue using non-renewable energy sources?
g. What do we use coal for?

2 **Read the text. What forms of energy are mentioned?**

Where's energy?

Energy is everywhere, and it exists in different forms. The food we eat gives us the energy we need to survive. It contains chemical energy and we use this energy to walk to school, to study science or to ride a bike. When we are riding a bike we are converting the chemical energy in our food into mechanical energy.

We use electrical energy to power the lights and electrical devices in our homes. We get the electricity from power plants. Most of them use non-renewable energy sources, such as coal, natural gas, petroleum and uranium. However, some of them also generate electrical energy by using renewable energy sources, such as solar, wind or hydroelectric energy.

Please switch off your electrical devices when you are not using them. We shouldn't waste energy.

3 **Read and say *True* or *False*. Correct the false sentences in your notebook.**

a. There are different forms of energy.
b. Food contains mechanical energy.
c. You use mechanical energy when you ride a bike.
d. Energy comes from different sources.
e. Petroleum is a renewable source of energy.
f. It's good to waste energy.

4 **Play the quiz!**

Reflect

1 **Answer the questions:**

a. What are the advantages of renewable energy sources?

b. How does pollution affect our lives?

2 **Check. Copy the chart and colour the stars.**

I can ...

name different **forms** of energy.

☆ ☆ ☆

I can ...

identify which energy sources are **renewable**.

☆ ☆ ☆

I can ...

read and write about some energy **transformations**.

☆ ☆ ☆

I can ...

identify which energy sources are **non-renewable**.

☆ ☆ ☆

I can ...

do an experiment about **acid rain**.

☆ ☆ ☆

I can ...

read and write about saving energy and **protecting the environment**.

☆ ☆ ☆

I can ...

describe who **Donna Strickland** is.

☆ ☆ ☆

I can ...

find information about **Elon Musk** on the Internet.

☆ ☆ ☆

I can ...

write and present a leaflet or podcast about **saving energy**.

☆ ☆ ☆

Key:

★ I'm not sure.

★★ I need some practice.

★★★ I understand.

3 **How do you want to show what you learned about energy in this unit?**

do a presentation draw a picture