



# ENERGY



wind turbines

## LEARNING SITUATION

### Key question

- Why do we need to save energy?

### Let's learn about ...

- forms of energy
- energy transformation
- renewable energy
- non-renewable energy

### Team project

- Design an eco-friendly home

# LET'S START!



**WATCH.** What are the two main types of energy sources?

**THINK BACK.** What are some advantages of renewable energy?

**LOOK.** What type of energy moves the turbines? Where can we find them?



The type of energy is ...

We can find them in ...



field

# WHAT IS ENERGY?

**Energy** is the ability to make things work. Living things need energy to grow and function. Energy also powers machines.

There are different forms of energy: mechanical, electrical, chemical, sound, light, thermal and nuclear energy.

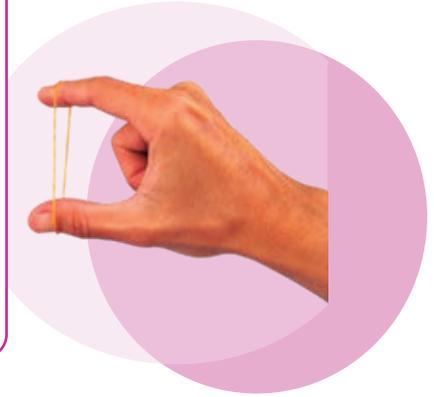
## Watch

What forms of energy can you find at school?

### Mechanical energy

Mechanical energy is the energy that produces **movement**. It's a combination of potential energy and kinetic energy.

- **Potential energy** is the energy stored in objects. It depends on their state and position. For example: when we stretch a rubber band, it has got potential energy.
- **Kinetic energy** is the energy of moving objects. When we release the rubber band, it goes back to its original shape.



### Electrical energy

Electrical energy or **electricity** comes from the movement of small particles called **electrons**.

- Power stations generate electricity from other forms of energy. The electricity then travels through power lines and wires to our homes. It makes our lamps, fridges and other devices work.
- Lightning is a natural source of electrical energy.



### Chemical energy

Chemical compounds store chemical energy. A **chemical reaction** releases the energy.

- Batteries store chemical energy. Machines can use this energy to do work.



### Sound energy

When the particles in objects vibrate, they produce sound energy. It travels in **waves** to our ears and we hear it as sound.

- The vibrations from speakers are sound energy.



## Light energy

Light energy is energy in the form of **electromagnetic waves**.

- Our main source of natural light energy is the Sun.
- Devices like torches are artificial sources of light energy.



## Thermal energy

Thermal energy is the kinetic energy of particles in objects. Hot objects have got more energy than cold objects because their particles are moving faster.

- We measure how hot or cold things are by their **temperature**.
- Our main source of natural thermal energy is the Sun. The heat from a bonfire also has got thermal energy.



## Nuclear energy

Nuclear energy comes from **radioactive materials** found in nature. Nuclear power stations use this energy to produce heat and generate electricity.

- Doctors can use nuclear energy in medical diagnosis and treatment.



## Activities

- 1 In your notebook, **MATCH** the words with the types of energy.

compounds heat position radioactive  
vibrations waves wires

- 2 **WRITE** five things your body needs energy to do.

- 3 **LOOK** and **ANSWER**. What type of energy is used?



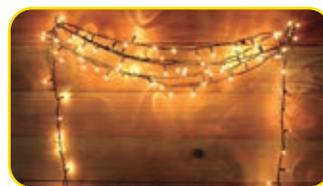
- a. You listen to music in a concert.



- b. You make toast for breakfast.



- c. You place your glass at the edge of a table.



- d. You turn on the string lights.

## Listen

Listen to this advert. Name the electrical devices.

## Key words

chemical energy  
electrical energy  
light energy  
mechanical energy  
nuclear energy  
sound energy  
thermal energy

# HOW DO WE TRANSFORM ENERGY?

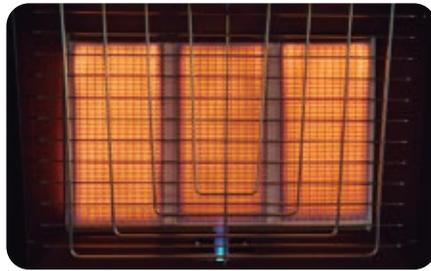
We can transform energy from one form to another. We can also **store, transport** and **transfer** energy between objects. However, we can't create or destroy energy.

## CHEMICAL ENERGY

We can transform chemical energy into other forms of energy.



Cars and planes transform chemical energy from fuel, such as diesel and petrol, **into mechanical energy**. This lets them transport people and cargo.



Gas heaters transform chemical energy from gas **into thermal energy**. Many people use gas heaters to keep their homes warm, especially in winter.

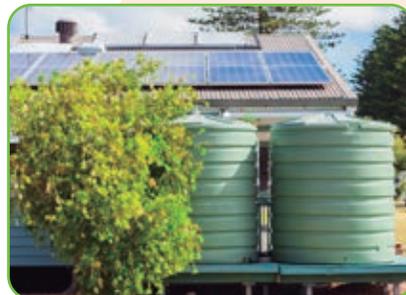


Your body can transform chemical energy from food **into mechanical energy** to move your muscles and **into thermal energy** to keep you warm. We measure the chemical energy in food in calories.

## LIGHT ENERGY

We can transform light energy into other forms of energy.

- Plants absorb light energy from the Sun and transform it **into chemical energy**.
- Some animals, such as deer, get **chemical energy** when they eat plants. Other animals, such as wolves, get it by eating other animals.
- Solar panels transform light energy **into electrical and thermal energy**.
- We use solar panels to **generate** and heat water for our homes.



## ELECTRICAL ENERGY

Electrical devices can transform electrical energy into other forms of energy.

- When we turn a light on, it transforms electrical energy into light energy and thermal energy.
- When we turn on the radio, it transforms electrical energy into sound energy.
- When we turn on the washing machine, it transforms electrical energy into mechanical energy.



### Think

How do we transform electrical energy in the classroom?

### Activities

- 1 In your notebook, **COPY** and **COMPLETE** the table.

Device	It transforms energy into ...
a. coffee machine	electrical energy into thermal energy



coffee machine



torch



fan



oven



computer



hair dryer

- 2 **EXPLAIN** how plants and solar panels are similar and different.

- 3 **AT HOME. FIND** what energy transformations happen in your home.

### Key words

store  
transform  
transport

# WHERE DOES RENEWABLE ENERGY COME FROM?

**Renewable** energy comes from **natural sources**, such as the Sun, wind, water and organic materials. We can use these sources many times. They **won't run out**. They are better for the environment because they cause less pollution.

However, renewable energy also has some disadvantages. The systems we need to build occupy a lot of space and can harm local animals and plants.

## Hydroelectric energy

Hydroelectric energy comes from the kinetic energy of **flowing water**.

- We build **dams** to store water in reservoirs. This water has got potential energy.
- When the water flows down through **pipes** in the dam, it has got kinetic energy. This energy moves **turbines** that generate electricity.
- **Power lines** transport the electricity to our homes.



## Solar energy

Solar energy comes from **the Sun**. It produces light energy and thermal energy. **Solar panels** can use this energy to generate electricity. Solar panels work best in places with many hours of sunlight.



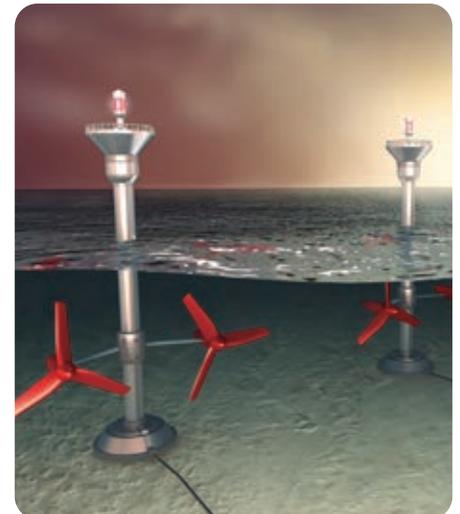
## Wind energy



Wind energy comes from the kinetic energy of **moving air**. This energy moves **wind turbines** that generate electricity.

## Tidal energy

**Tidal energy** comes from the kinetic energy of **ocean tides**. When the tide changes, it moves **turbines** under the water. Tidal turbines work best in areas with strong currents.



## Biofuel energy

Biofuels are **organic materials** from plants and animals. Biofuels have got chemical energy. We burn them in **production plants** to produce thermal energy.

We shouldn't cut down forests to grow plants for biofuel. When we burn biofuels, it produces greenhouse gases.



**biomass**  
solid wood pellets



**bioliquid**  
biodiesel



**biogas**  
biomethane



## Explore

Do the Class  
WebQuest. 

## Geothermal energy

Geothermal energy comes from **heat inside the Earth**. This is the same energy that creates volcanoes and hot springs. **Geothermal power plants** use hot water and steam to move **turbines** and generate electricity.



## Activities

**1 THINK** of one disadvantage for each type of renewable energy.

 **SHARE** your ideas with a partner.

birds forests greenhousegases habitats  
noise sea life space cost

**2 In your notebook, WRITE** the type of renewable energy.

- It comes from the energy of air that is moving.
- It moves turbines under the water in the ocean.
- It uses light and heat to generate electricity.
- It comes from thermal energy inside the Earth.
- It uses the chemical energy of organic materials.
- It comes from the energy of water in a reservoir.

**3 EXPLAIN** where the chemical energy in biofuels comes from.

One disadvantage  
of solar energy is ...



## Key words

biofuel energy  
geothermal energy  
hydroelectric energy  
solar energy  
tidal energy  
wind energy

# WHERE DOES NON-RENEWABLE ENERGY COME FROM?

**Non-renewable** energy comes from **natural sources** such as fossil fuels and radioactive materials.

It takes a long time for nature to replace these materials, so they **can run out**. Their use has got a negative effect on the environment.

## FOSSIL FUELS

**Fossil fuels** come from **plants** and **animals** that lived and died millions of years ago. Sand and rocks covered them over time. Then heat and pressure transformed them into **coal**, **petroleum** and **natural gas**.



**Coal** is a hard, black mineral that's mostly carbon. We extract coal from mines and burn it to produce heat. Power plants can use this heat to generate electricity. However, burning coal produces a lot of pollution.



**Petroleum** is a black, liquid mineral that's mostly carbon and hydrogen. We extract petroleum from wells and use it to make fuel, such as petrol and diesel. We also use petroleum to make plastic. This produces less pollution than burning coal.



**Natural gas** is mostly carbon and hydrogen. We use this gas to cook and to heat our homes. Some power plants burn natural gas to generate electricity. This produces less pollution than burning coal or liquid fuel, but it still produces greenhouse gases.

## RADIOACTIVE MATERIALS

**Uranium** is a radioactive metal that formed billions of years ago. It has got enormous amounts of energy. Nuclear power stations use nuclear energy to heat water and make steam. The steam moves turbines to generate electricity. Nuclear energy produces dangerous waste that we must store safely to prevent accidents.



1 billion is a very big number 1 000 000 000 000

## Watch

How does pollution damage the environment?

## THE NEGATIVE EFFECTS OF FOSSIL FUELS

When we burn fossil fuels, we produce pollution. This has negative effects on the environment and contributes to the **climate crisis**.

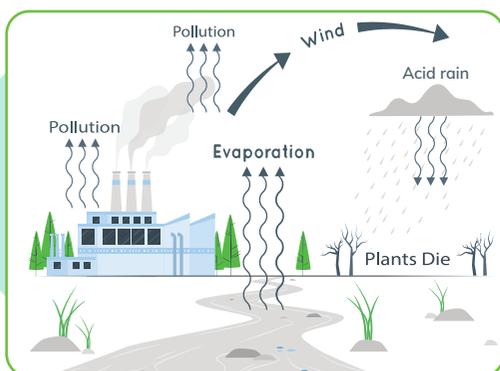
### Global warming

The Earth's atmosphere contains **greenhouse gases**, such as carbon dioxide.

1. When thermal energy from the Sun reaches the Earth, the greenhouse gases trap some of it in the surface.
2. The rest of the thermal energy reflects back to space.

This is the **greenhouse effect**. It helps keep our planet at the right temperature for us to live on.

3. When we burn fossil fuels in factories or in transport, we release extra greenhouse gases into the atmosphere.
4. The increase of these gases stops the thermal energy from escaping. The Earth becomes hotter, this leads to **global warming**.



### Acid rain

Burning fossil fuels releases sulphur dioxide and nitrogen oxides. These pollutants combine with oxygen and water in the air and become **acid rain**. When acid rain falls, it damages plants and pollutes the land and water.

## Activities

- 1 In your notebook, **COMPLETE** the sentences.

carbon electricity non-renewable radioactive wells

- a. Fossil fuels are ... energy sources.
- b. Coal is a hard mineral that is mostly ...
- c. Petroleum is a liquid that we extract from ...
- d. Power plants burn natural gas to generate ...
- e. Uranium is a ... metal.

- 2 What is the best fossil fuel to use? **COMPARE** the three types.

- 3 **EXPLAIN** what happens when there is an increase of greenhouse gases in the atmosphere.

## Listen

Listen to the news broadcast. Describe what's happening.

## Key words

acid rain  
fossil fuel  
global warming  
greenhouse effect  
uranium

KEY WORDS

- 1 In your notebook, **COPY** and **COMPLETE** the sentences.
- When the particles in objects vibrate, ... travels to our ears.
  - ... makes fridges and other devices work in our homes.
  - Cars and planes can ... chemical energy from fuel into mechanical energy.
  - Solar panels ... electricity and heat water for our homes.
  - We get ... from the kinetic energy of moving air.
  - ... come from plants and animals that died a long time ago.

LET'S TALK!

- 2 **MAKE** questions with the present perfect and **ever**.  
you / stretch / a rubber band?

Have you ever stretched a rubber band?



- your family / visit / a power station?
- you / see / lightning in the sky?
- your parents / make / a big bonfire?
- you / turn on / the washing machine?
- your family / travel by train?
- you / feel / an earthquake?
- your family / visit / a dam?

- 3 **ASK** and **ANSWER** the questions in activity 2.  
Use the Language tip box to help you.

Have you ever stretched a rubber band?



Yes, I have. I released it and it flew away!

electrical energy

generate

fossil fuels

wind energy

transform

sound energy

Language tip



We use the **present perfect with ever or never** to talk about experiences in the past.

**I've** never **visited** a hot spring.

**Has** Emma ever **travelled** by plane?

No, she **hasn't**.

**Have** they ever **seen** a wind turbine?

Yes, they **have**.

Acid rain contains harmful pollutant gases mixed with oxygen and water. How can this mixture affect plants?

We can use vinegar, an acid, to simulate acid rain.

### HYPOTHESIS

What do you think will happen?

Write your hypothesis.

### MATERIALS

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



### STEP 1

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



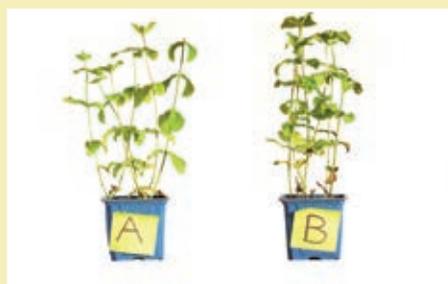
### STEP 2

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



### STEP 3

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



### STEP 4

Observe the plants every day and take notes.

### RESULTS

Compare your results with a partner.



## DESIGN AN ECO-FRIENDLY HOME

An eco-friendly home is a house that uses renewable energy sources for power. Architects design eco-friendly homes to respect the environment.

### DISCUSS

- 1 **ANSWER** the questions with your classmates.
  - a. What are the advantages of building an eco-friendly house?
  - b. What are examples of eco-friendly materials?
  - c. What renewable energy can eco-friendly homes use?



### RESEARCH

- 2 **LOOK** at the photos of eco-friendly elements you can have in your home. **ANSWER** the questions.



Recycling bins



Insulated floors



Solar panels



System to collect rainwater

- a. Which element do you think is the most common?
- b. Do you have any of these elements in your home?

## COLLABORATE

- 3** **THINK** about the things you do at home to help protect the environment. How can your family make your home more eco-friendly?
- 4** **CREATE** a mind map with your ideas.

## TAKE ACTION

- 5** Your city wants to build more eco-friendly homes to fight climate change. In groups, **PLAN** your new home. **ANSWER** the questions with your team.
- Which renewable energy sources can you use to power the home?
    - Can you use natural light instead of electricity?
    - Can you collect and store rainwater?
  - How can you save energy in the home?
    - How can you keep heat inside your home in the winter?
    - How can you keep your home cool in the summer?
  - How can you reduce waste in the home?



To collect rainwater we can ...



To keep our house warm in the winter we can ...



- 6** **DESIGN** your home. You can draw a plan or make a model. Write the eco-friendly elements you include.

## SHARE

- 7** Present your new home to the class. **EXPLAIN** the eco-friendly elements and how they can help protect the environment.

## TEAM ASSESSMENT

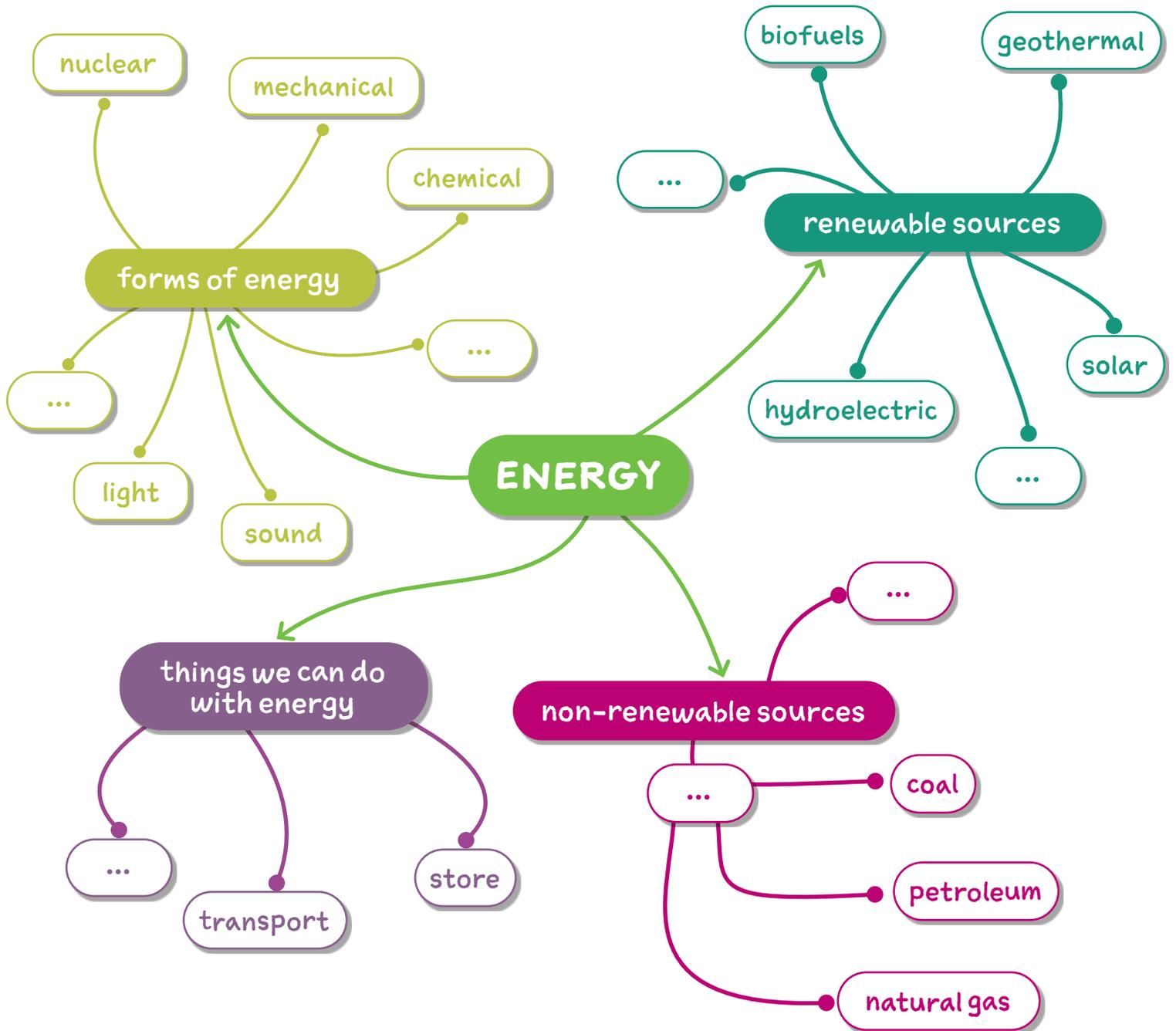


- ★ Give your classmates constructive feedback.
- What do you like about their home?
  - Is their explanation clear?
  - Is the information about eco-friendly measures correct?

# MIND MAP

1 In your notebook, **COPY** and **COMPLETE** the mind map.

thermal    tidal    greenhouse effect    uranium  
 sound    transform    fossil fuels    wind



**acid rain:** harmful rain that comes from the mix of air pollution with the water in clouds.

**biofuel energy:** chemical energy in organic materials from plants and animals. We burn them to produce thermal energy.

**chemical energy:** energy from chemical reactions.

**electrical energy:** energy from the movement of small particles called electrons. This energy is also called electricity.

**fossil fuel:** non-renewable energy from plants and animals that died millions of years ago.

**geothermal energy:** energy from the heat inside the Earth.



**greenhouse effect:** other gases in the atmosphere, such as carbon dioxide, that keep the Earth from losing heat.

**hydroelectric energy:** kinetic energy from flowing water that we use to generate electricity.

**light energy:** energy in the form of electromagnetic waves. The Sun produces light energy.

**mechanical energy:** energy that produces movement. It is a combination of potential and kinetic energy.

**nuclear energy:** energy from radioactive elements, such as uranium. Nuclear power stations use this energy to generate electricity.



**solar energy:** energy from the Sun in the form of light and heat.

**sound energy:** energy from the vibrations of particles in objects. The vibrations travel in waves to our ears. We hear them as sound.

**store:** keep something in a place to use it later. For example, batteries store energy.

**thermal energy:** kinetic energy from the particles in objects. In cold objects, the particles move slowly. In hot objects, they move faster.

**tidal energy:** kinetic energy from ocean tides that make the water move up and down.

**transform:** change something into a different form. Turbines transform kinetic energy into electrical energy or electricity.

**uranium:** radioactive metal that we can use to produce nuclear energy.

**wind energy:** kinetic energy from moving air that wind turbines can use to generate electricity.





**1** Are the sentences true or false? **CORRECT** the false ones in your notebook.

- a. Energy is the ability to make things work.
- b. Mechanical energy combines potential and chemical energy.
- c. Lightning is a source of wind energy.
- d. Batteries store chemical energy that devices can use to do work.
- e. Sound energy has got the form of electromagnetic waves.
- f. The heat we get from the Sun is a form of thermal energy.

**2** **LOOK** at the photo and **ANSWER** the questions.



- a. What do you see in the photo?
- b. What source of energy does it use?
- c. What can doctors do with this energy?

**3** **MATCH** the verbs and sentences.

transport absorb generate  
transform store

- a. Planes ... chemical energy into mechanical energy.
- b. Solar panels can use light energy to ... electricity.
- c. Plants can ... light energy from the Sun and use it to grow.
- d. Power lines ... electrical energy.
- e. Dams ... water with potential energy.

**4** **LOOK** at the photos. **COMPARE** how the car and the cow transform energy.



**5** **COPY** and **COMPLETE** the table.

tidal heat Sun chemical  
hydroelectric kinetic

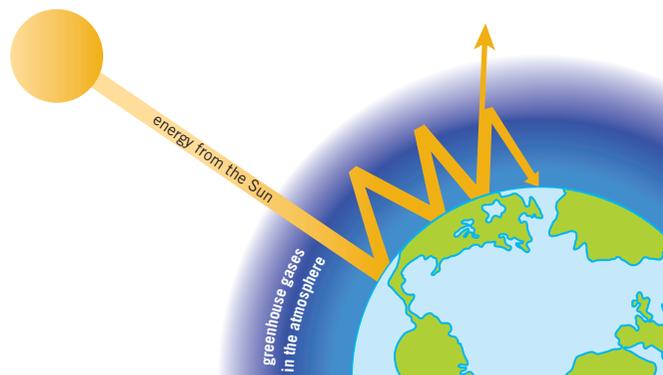
Renewable energy	Natural source	Type of energy
solar energy	...	light and thermal energy
... energy	water	potential and kinetic energy
wind energy	wind	... energy
... energy	ocean tides	Kinetic energy
biofuels	organic materials	... energy
geothermal energy	... inside the Earth	thermal energy

**6 ANALYSE** the differences between fossil fuels and **COMPLETE** the text.

carbon petrol cooking electricity  
liquid mines heat wells hard

- Coal is a black, ... mineral. We extract it from ... and burn it to produce ... .
- Petroleum is a black, ... mineral. We extract it from ... and use it to make fuel, like ... and diesel.
- Natural gas is ... and hydrogen. We use it for ... , heating and generating ... for our homes.

**7 EXPLAIN** the greenhouse effect and how it is affected by pollution. Use the diagram help you.



- Greenhouse gases ...
- The thermal heat from the Sun ...
- Burning fossil fuels ...

**APPLY**

**8 LOOK** at the photos and **ANSWER** the questions.

- Which place has got a higher level of pollution?
- What activities can cause air pollution and global warming?
- How can we reduce pollution in our cities?



**Class Quiz** ?  
Do the Class Quiz. 🖱️

**SELF-ASSESSMENT** 💡

★ Reflect on your learning and complete in your notebook.

- a. Now I know that ...
- b. I want to learn more about ...
- c. I need to get better at ...