

Chapter 4 Forms of energy

Introduction

This chapter comprises a set of activities that focuses on the energy sources and conversion.

The activities illustrate

- The concept and forms of energy;
- The different energy sources that we use;
- Energy usage in the home;
- The differences between renewable and non-renewable energy sources;
- The types of renewable resources

The work sheets for the various activities are collated at the end of each chapter



Activity 4.1: The story of energy

Study the picture showing the energy sources used throughout human history and then complete the tasks below.

Tasks:

Colour the drawing using the crayons and colour pencils provided and describe what the picture shows.

What types of energy are being used?

Can you tell which ones are renewable and which ones are non-renewable?

What are the differences between these two?

Imagine the energy usage in the future. How do you think it will change?

Do you think we will be using the same energy sources? Discuss with your friends in your group.

Notes for teachers:

Background: This is an activity to study different types of energy sources and the differences between renewable and non-renewable energy.

The aim of the activity is:

- understanding of energy sources used throughout human history
- distinguishing between renewable and non-renewable energy sources
- discussing the use of energy and how it might change in the future

Material: Illustration, colour pencils and crayons.

Key words: Energy, coal, petrol, gas, renewable energy, non-renewable energy, solar energy, hydropower, wind energy, nuclear energy, fossil fuels, resources, industrial revolution

Skills: Working alone and in groups, observation and interpretation, comparison and information sharing

National curriculum subjects: geography, history, science, citizenship, art and design, languages.

Age Range: 9-12, key stage 2-3

Activity 4.2: Energy awareness

We use energy all the time often without realising it as it exists in many forms

Working in small groups consider the following questions

Tasks:

Identify usage of energy in your daily life from the time you get up until you go to sleep

Compile a list such as how you travel to school and which electrical devices do you use

Identify the resources that each form of energy uses - do you know where they come from?

If you were only able to have three uses of energy a day because energy in short supply which ones would your group choose

Notes for teachers:

Background: This discussion is to raise awareness of how energy is used in every day life and where it comes from. The idea of doing without something we take for granted is really a reflection of what one day might happen with energy derived from fossil fuels rather than renewable energy sources

The aim of the activity is:

- understanding where energy is used and from what source

Material: paper and pencil

Key words: energy usage, forms of energy, energy resources, fossil fuels

Skills: Working in groups, observation, information sharing and presentation

National curriculum subjects: Science, natural sciences, social sciences, languages, citizenship

Age Range: 8-11 key stage 2

Activity 4.3: Lemonade without energy

You need a lemon squeezer for this activity.

Tasks:

Working in groups, make lemonade using the recipe provided.

Ingredients: 1 lemon, 3/4 cups of sugar, 6 cups cold water

Recipe: Squeeze lemon juice over sugar, then add water, stir them altogether.

When you are happy with your lemonade share it out and drink it. While you are drinking, think about and discuss with your group how and why we use electricity in our homes.

Make a list of all the ways we use electricity and write down any alternatives you can think of that avoid these uses of electricity,

Notes for teachers:

Background: Pupils will make fresh lemonade without electricity and discuss the importance of energy use in our daily lives.

The aim of the activity is;

- understanding the role of electricity in our lives
- promoting energy saving behaviour

Material: Lemons, lemon squeezer, sugar, water, glasses

Key words: heat, electricity, mechanical-kinetic energy

Skills: Working in groups, communication, comprehension, interpretation and problem solving skills.

In groups, they will make lemonade with a squeezer. Therefore they should bring a lemon squeezer and lemons from home.

National curriculum subjects: Natural sciences, science, citizenship, social sciences

Age Range: 9-13 key stage 2-3

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Activity 4.4: Energy conversion

We use an engine or a machine to convert energy from its initial state into a form in which it can do useful work (secondary state) form to another and the final use of energy in our homes.

Tasks:

Consider each energy form within your group and then complete the table by filling in the missing words listed below the table

Choose one of the concepts (rows) and represent it by miming (charades) in front of your class. The rest of the class should try to guess it. You may run a competition between the groups if you like!

Notes for teachers:

Background: This activity is a game to study primary energy and energy sources, the means that we use for converting energy, and to understand energy usage in the home in relation to the primary energy sources.

The aim of the activity is;

- understanding the energy cycle
- learning the differences between energy sources, primary energy, end use of energy and studying the relationship between them

Material: Worksheet for completion.

Key words: Primary energy, fuel, power station, end use of energy, coal , gas, electricity, petrol, wind turbine, solar energy, fuel cell

Skills: Working in groups, cause-and effect associations, setting links between the elements, observation, information sharing and presentation

National curriculum subjects: Science, natural sciences, social sciences, languages, citizenship

Age Range: 9-13 key stage 2-3

Completed worksheet for the activity:

Primary energy	Engine/Machine	Secondary energy	End use
Natural gas,	Boiler	Space heating	Heating the house
Water	Mill	Kinetic/mechanical energy	Flour production
Bread	Human body	Kinetic energy	walking
Wind	Wind turbine	Electricity	Lighting
Sun	Solar panels	Water heating	Having a shower
Uranium	Nuclear plant	Electricity	Watching TV
Sun	Photovoltaic	Electricity	a fridge to preserve food
Biomass	boiler	Heating	hot water
Natural gas	Bus	Mechanical/kinetic energy	Passenger transportation
Hydrogen	Fuel cell	electricity	Electric vehicles
Water	Turbines	electricity	Charging a mobile phone
Coal	Power plant	Electricity	washing machine for clothes
Petrol	Car engine	Mechanical/kinetic energy	Transportation

Activity 4.6: forms of energy

This activity identifies the various forms of energy

Task:

Working with your group, complete the worksheet.

Fill in the blanks with the words at the bottom of the page.

Notes for teachers:

Background: energy exists in various forms and is all around us in everyday use

The aim of the activity is:

- General revision and reinforcement of the definition, forms, sources and types of energy.

Material: worksheet for completion.

Key words: radiant, gravitational, chemical, thermal, nuclear, electrical, mechanical, kinetic, potential, sound, motion, conservation of energy, energy efficiency

Skills: Working in groups, communication, understanding and interpretation, information sharing, and observation.

National curriculum subjects: Natural sciences, science, citizenship, social science, languages

Age: 9-13 key stages: 2-3

Completed worksheet for the activity

1. Energy that is stored within an object is called potential energy.
2. Compressed springs and stretched rubber bands store mechanical energy.
3. The vibration and movements of the atoms and molecules within substances is called heat or thermal energy.
4. The energy stored in the centre of atoms is called nuclear energy.
5. The scientific rule that states that energy cannot be created or destroyed is called the Law of Conservation of energy.
6. The movement of energy through substances in longitudinal waves is sound.
7. The energy of position - such as a rock on a hill is gravitational energy.
8. The movement of objects and substances from place to place is motion.
9. Electromagnetic energy travelling in transverse waves is radiant energy.
10. Energy stored in bonds of atoms and molecules is chemical energy.
11. The movements of atoms, molecules, waves and electrons is Kinetic energy.
12. The movement of electrons is electric energy.
13. The amount of useful energy you get from a system is its energy efficiency.
14. The energy in petroleum and coal is stored as chemical energy.
15. X-rays are an example of radiant energy.
16. Fission and fusion are examples of nuclear energy.
17. A hydropower reservoir is example gravitational energy.
18. Wind is an example of the energy of motion.

Activity 4.7: The Sun Factory

You will be visiting the place called the Sun Factory which uses a number of different types of renewable energy sources

Task:

Examine the questions on your worksheet before the visit then work with your group to answer them.

Notes for teachers

Background: Pupils learn how a solar system works. The activity is a tour of a demonstration of solar power. The location can be a centre or a building which uses renewable energy sources. If the building has guides and information panels, students will benefit more from the activity.

Aims of the activity

- understanding how a solar panel works
- observing and understanding the performance of a solar thermal system
- observing and understanding the performance of a solar PV system

Material: worksheets for completion.

Key words: Solar panel, storage, pump, electricity, photovoltaic effect

Skills: working in groups, setting cause-effect relations, experimentation, understanding and interpretation, observation.

National curriculum subjects: Natural sciences, science, citizenship, physics, geography

Age Range: 10-14 key stages: 2-3

Activity 4.8: The Sun Festival

Remember the visit to the solar building/centre. You are going to prepare an illustration or a poster about this visit and the use of renewable energy

Task:

Discuss the visit and what you learnt about solar energy within your group. Decide what you are going to illustrate in your poster.

Once finished you can hang your poster on the walls of your class or in the poster area of your school.

Notes for teachers:

Background: Pupils are requested to express artistically what they have learnt in the visit to the solar centre/building. This activity can be turned into a bigger event if the other classes join and the school might be decorated with artistic expressions relating to the sun and energy.

Aims of the activity

- Revising the previous activity by depicting the theme
- Informing about the utilisation of solar energy for heating and electricity production

Material: cardboards, crayons, pencils, glue, poster paint, brush

Key words: Solar thermal energy, photovoltaic system, solar energy,

Skills: Observation, creation, imagination, working in groups, understanding and interpretation, information sharing,

National curriculum subjects: science, citizenship, physics, art and design

Age Range: 9-12, key stage 2-3

Activity 4.9: Your own electric circuit

This is an experimental activity working within a group! You will see how electricity is produced by a solar cell. You will also examine how a light bulb is turned on and how much heat it produces and be able to compare the light and heat output of incandescent bulbs and compact florescent lamps

Notes for teachers

Background: An electric circuit is to be constructed by using a solar cell as the power source.

Aims of the activity

- representing the performance of the electric system
- understanding the consequences of the production of electricity

Material: Recycled board, second hand cables, bulb, batteries, solar PV cell

Key words: Thermal energy, electrical energy, battery, electric circuit, solar cell, solar energy

Skills: Information sharing, data interpretation, experimentation, working in group, observation

National curriculum subjects: Manual crafts, science, design and technology, physics

Age Range: 9-16 key stage 2-4

Activity 4.10: Wind Energy

Energy from the wind is one of the oldest forms of energy used by mankind and windmills are still in existence whose design dates back more than 5000 years

Task:

Working with your group, complete the worksheet by filling in the blanks with the words at the bottom of the page, using each word once.

Notes for teachers:

Background:

The aim of the activity is:

- understanding the principles of wind energy

Material: worksheet for completion.

Key words: electricity, renewable, sun, generator, windmill, wind farm

Skills: Working in groups, communication, understanding and interpretation, information sharing, observation.

National curriculum subjects: Natural sciences, science, citizenship, physics, languages

Age: 9-12 key stages: 2-3

Completed worksheet for the activity

1. The sun shines on the Earth. The land heats up faster than the sea. The warm air over the land rises. The cool air over the sea moves in to take its place. This moving air called wind.
2. The sun will always shine; the wind will blow. We call wind a renewable energy source. Because it will never run out.
3. A windmill can capture the energy in the wind.
4. The spanning blades of a windmill turn a generator to make electricity.
5. Sometimes there are many windmills put together to make electricity. This is called a wind farm.

Activity 4.11: Solar Energy

You will be given a worksheet to fill in. Read it through carefully with your group friends.

Task:

Work with your group friends to complete the worksheet. Fill in the blanks with the words at the bottom of the page, use each word once.

Notes for teachers:

Background: The students will fill in the blanks with the words at the bottom of the page.

The aim of the activity is;

- understanding the principals of solar energy

Material: worksheet for completion.

Key words: renewable, rays, sun, store, solar collectors, solar cells

Skills: Working in groups, communication, understanding and interpretation, information sharing, observation

National curriculum subjects: Natural sciences, science, citizenship, physics, languages

Age: 9-12 key stages: 2-3

Completed worksheet for the activity

1. We get solar energy from the sun, which is a big ball of gases.
2. Solar energy travels to the earth in rays.
3. The sun will always shine, so we say solar energy is a renewable energy source. Because it will never run out.
4. Plants store solar energy in their leaves.
5. Some solar energy is light so we can see.
6. Solar energy contains rays which heats the earth
7. People use solar collectors on their roofs to heat their houses and water.
8. Solar calculators use solar cells to turn energy from the sun into electricity.
9. People also use to convert solar energy into the electricity

Activity 4.12: energy source crossword

You have a crossword to solve. Working within your group, complete the crossword.

Remember the subject (what is energy?, energy sources and types of energy) you studied.

Notes for teachers:

Background: solving a crossword whose main theme is the forms and sources of energy

The aim of the activity is;

- General revision of the types, and the sources of energy

Material: crossword for completion.

Key words: geothermal, natural gas, petroleum, coal, uranium, propane

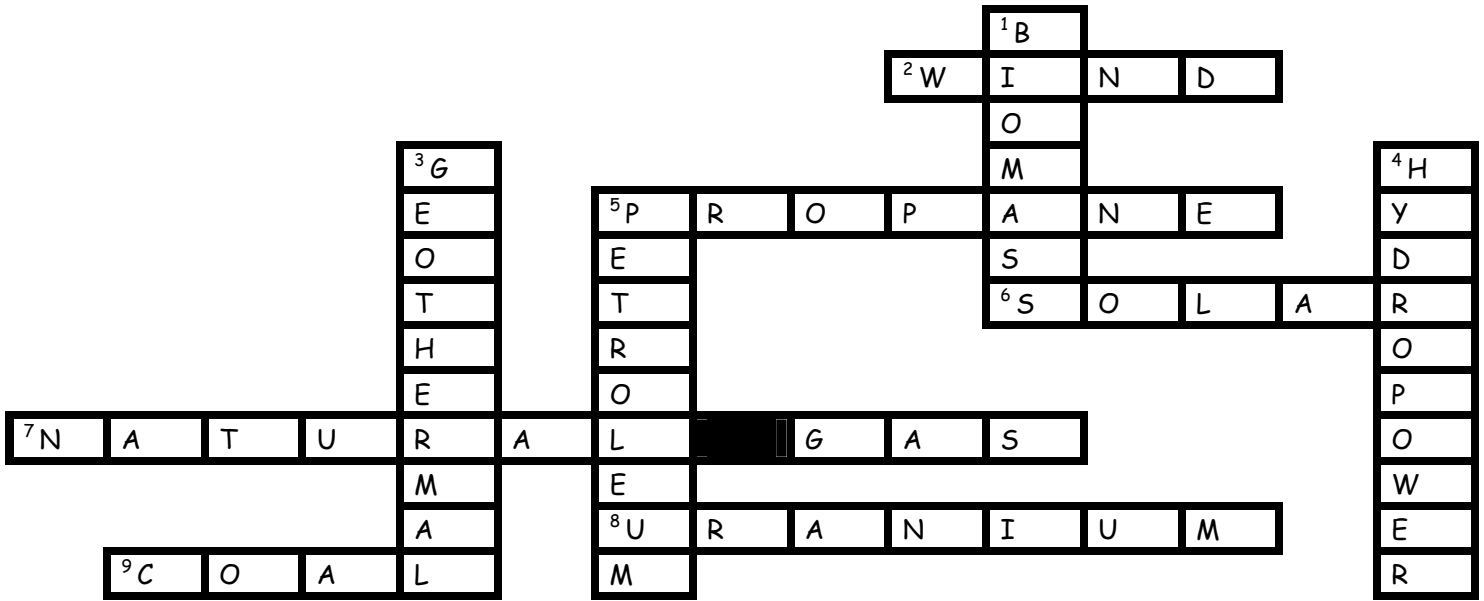
Skills: Working in groups, communication, understanding and interpretation, information sharing, and observation.

National curriculum subjects: Natural sciences, science, languages

Age Range: 10-13 key stage 2-3

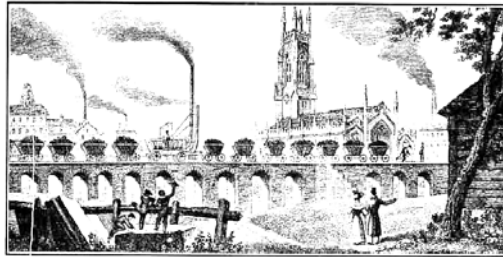
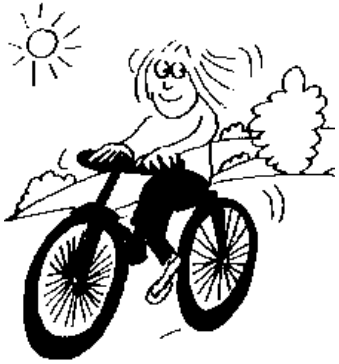
Completed worksheet for the activity

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Activity4.1: The story of energy



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Worksheet 4.3: Energy conversion

Complete the boxes which have??

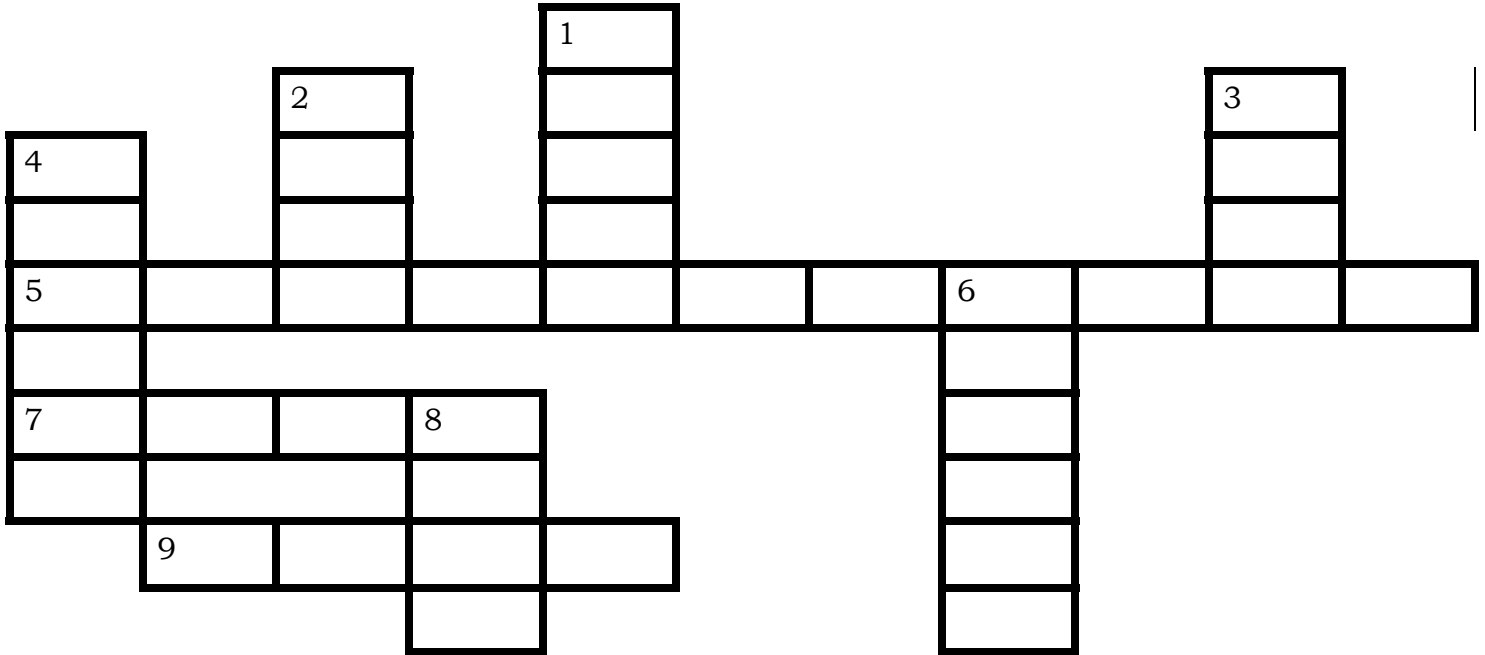
Words to fill in

Primary energy	Engine/Machine	Secondary energy	End use
Natural gas,	Boiler	??	Heating the house
Water	??	Kinetic/mechanical energy	Flour production
Bread	Human body	Kinetic energy	??
??	Wind turbine	Electricity	Lighting
Sun	Solar panels	??	Having a shower
Uranium	Nuclear plant	??	??
??	Photovoltaic panels	Electricity	??
Biomass	Boiler	??	hot water
Natural gas	Bus	Mechanical/kinetic energy	??
Hydrogen	Fuel cell	??	Electric vehicles
Water	??	electricity	Charging a mobile phone
Coal	Power plant	??	washing machine for clothes
??	Car engine	??	Transportation

Electricity walking hot water mechanical/kinetic energy wind petrol
 passenger transportation space heating sun turbine electricity
 mechanical/kinetic energy television having a shower fridge to preserve food
 water heating

Worksheet 4.5: energy crossword

Complete the crossword below



ACROSS

- 5. The energy we use to run many machines.
- 7. Sugar gives us energy to _____
- 9. Energy doesn't disappear; it changes to another _____.

DOWN

- 1. We use _____ energy to see.
- 2. We use energy to _____ from place to place
- 3. Energy gives us _____ to Keep us warm.
- 4. _____ is the ability to do work
- 6. A machine allows us to _____ energy from one form to another
- 8. Energy is the ability to do _____.

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Worksheet 4.6: forms of energy

Fill in the blanks with the words at the bottom of the page. You can use words more than once.

1. Energy that is stored within an object is called _____ energy.
2. Compressed springs and stretched rubber bands store _____ energy.
3. The vibration and movements of the atoms and molecules within substances is called heat or _____ energy.
4. The energy stored in the centre of atoms is called _____ energy.
5. The scientific rule that states that energy cannot be created or destroyed is called the Law of _____.
6. The movement of energy through substances in longitudinal waves is _____.
7. The energy of position - such as a rock on a hill is _____ energy.
8. The movement of objects and substances from place to place is _____ energy.
9. Electromagnetic energy traveling in transverse waves is _____ energy.
10. Energy stored in bonds of atoms and molecules is _____ energy.
11. The movements of atoms, molecules, waves and electrons is _____ energy.
12. The movement of electrons is _____ energy.
13. The amount of useful energy you get from a system is its _____.
14. The energy in petroleum and coal is stored as _____ energy.
15. X-rays are an example of _____ energy.
16. Fission and fusion are examples of _____ energy.
17. A hydropower reservoir is example _____ energy.
18. Wind is an example of the energy of _____.

radiant	gravitational	chemical	thermal	nuclear	
electrical	mechanical	kinetic	potential	sound	motion
conservation of energy		energy efficiency			

Worksheet 4.7: The Sun Factory

Please answer the questions below:

What is a solar panel?

What is photovoltaic effect?

What does a PV system mean?

Explain how a solar thermal panel (water heater) works?

What is the main difference between a PV system and a solar thermal heater?

Worksheet 4.10: Wind Energy



Fill in the blanks with the words at the bottom of the page. You can use words more than once.

1 The _____ shines on the Earth. The _____ heats up faster than the water.

The warm air over the land _____. The _____ cool air over the water moves in to take its place. This _____ is wind.

2 The sun will always shine; the wind will blow. We call wind a _____ energy source. Because it will never _____

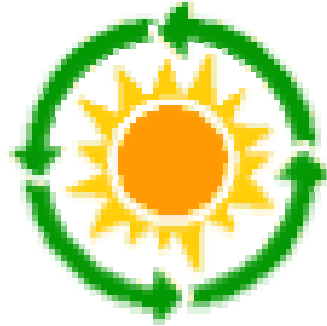
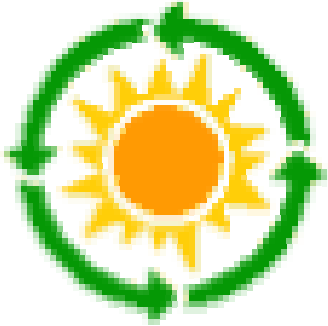
3 A _____ can capture the energy in the wind.

4 The spanning blades of a windmill turn a _____ to make _____.

5 Sometimes there are many windmills put together to make electricity. This is called a _____.

renewable	sun	generator	windmill	rises	wind farm
cool	moving air	electricity	land	run out	

Worksheet 4.11 Solar energy



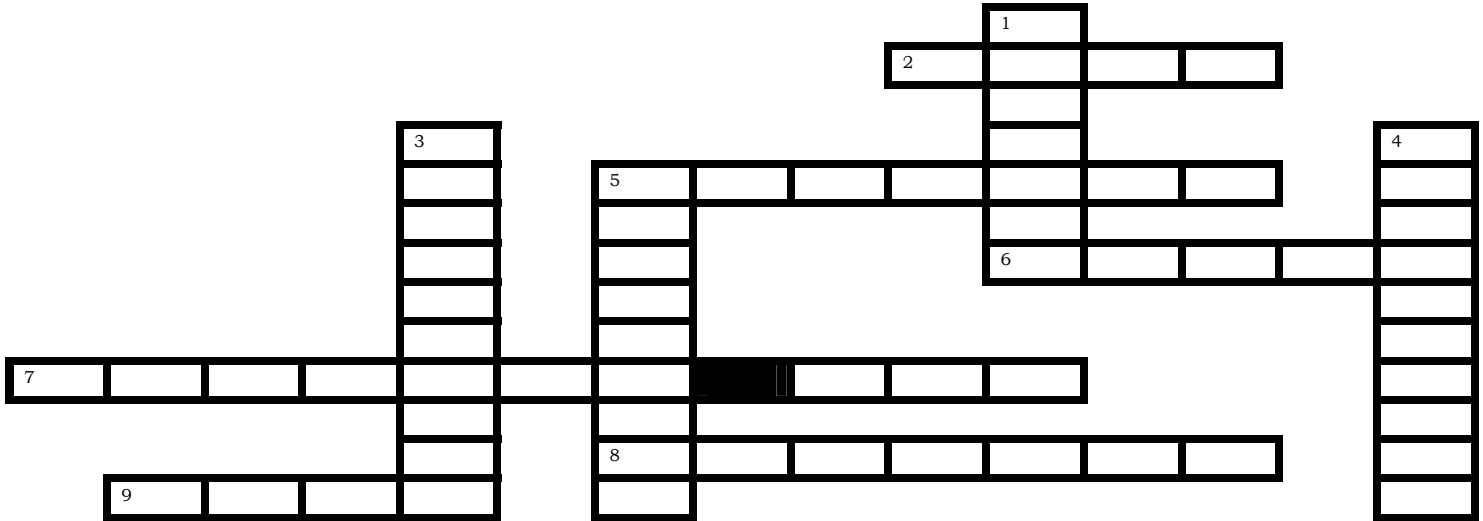
Background: Fill in the blanks with the words in the box at the bottom of the page. Use each word only once

1. We get solar energy from the _____, which is a big ball of _____.
2. Solar energy travels to the earth in _____.
3. The sun will always shine, so we say solar energy is a _____ energy source. Because it will never
4. Plants _____ solar energy in their leaves.
5. Some solar energy is _____ so we can see.
6. Solar energy contains rays which _____ the earth.
7. People use _____ on their roofs to heat their house and water.
8. Solar calculators use _____ to turn energy from the sun into _____.
9. People also use _____ to convert energy into electricity

Renewable	rays	sun	store	solar collectors	solar cells
electricity	heat	light	gases	run out	photovoltaic panels
solar thermal panels					

Worksheet 4.12: energy source crossword

Complete the crossword below



ACROSS

- 2. The energy of moving air.
- 5. A hydrocarbon gas used for heating
- 6. The energy from the sun.
- 7. Type of gas moved in pipelines.
- 8. An atom of this element can split to help generate electricity
- 9. Black solid fossil fuel.

DOWN

- 1. This energy is waste and wood.
- 3. Heat energy from inside the earth.
- 4. The energy in flowing water.
- 5. Liquid fossil fuel.