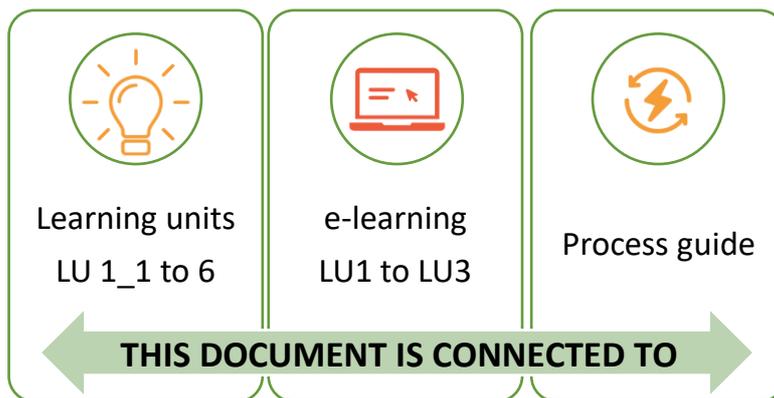




Our Solar Town

Learning Unit 1.1

Energy sources and renewable energy



akaryon⁰
WERTTOOLS • UMWELT • FÖRDERUNGEN



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Learning Unit 1.1 - Learning Plan

Energy sources and renewable energy

"Energy cannot be created or destroyed; it can only be changed from one form to another."

Albert Einstein



Energy is the ability to perform work! Energy is used everywhere. We, as human beings, depend on energy. The energy enables our cars, airplanes, and other vehicle to move, allowing us to use transportation. Energy in our homes is used for heating, cooking, lighting, use of home appliances and home electronics. Energy is also stored in the plants we eat, allowing us to move. It is also needed for our own growth and in a broader sense to live. The energy stored in plants is transformed into energy

in our bodies to power our muscles and our brain and other organs to function.

Transformation of energy cannot only be found in our bodies but also in cars, lightbulbs and other machines where electricity or any different fuels are transformed to some sort of work or movement.

Throughout history of humankind the energy consumption constantly increased and therefore different types of energy sources must be found and used.

1. RENEWABLE SOURCES OF ENERGY = energy that never runs out

SUN

The sun is the source of life on Earth. Not only gives it light, but also provides us with heat. Without light and heat from the sun, the Earth would be lifeless.

The sun allows plants to grow and produce food. It heats the water, forming the natural water cycle and causing rain. These are only two examples of the sun's impact on all life on Earth.



The sun's energy can be collected and used. Collecting solar energy with the use of solar panels dates back in the year 1890. The energy was used to heat water. Today, different technologies are used to harness solar energy, not only to heat the water but also for the transformation to electric power. Solar energy is affordable and almost without negative impact on the environment.





WIND

Wind has been used to power windmills for centuries. Windmills transform energy from wind power to be used for grinding grain or pumping water from wells. Nowadays, wind is used by wind turbines to produce electricity. The technology of collecting wind energy is environmentally friendly, but has one flaw - there is not enough wind everywhere.



WATER



Water powered wheels have been used for ages for grinding grain and sawing wood. Using similar technology, hydropower plants, are used in the present to produce electricity.

In the future we expect to have the knowledge and technology to use the energy of the oceans more frequently. The technology is already in the process of development. The tide, as well as changes in the temperature of the water are already in use to produce electricity.

The only issue with this technology is, that there are only a few appropriate places on Earth for this type of power plant.

There is another source of hot water on Earth and it can be used as an energy source too. Hot water is stored under the Earth's surface, named geothermal energy. It is used for heating buildings and greenhouses, but also for spas and health resorts due to therapeutic effects.

BIOMASS

Biomass represents all organic material from household waste, forest residues, sawdust, compost residues to animal residues. It is used to produce electricity or heat. It is environmentally friendly and renewable.

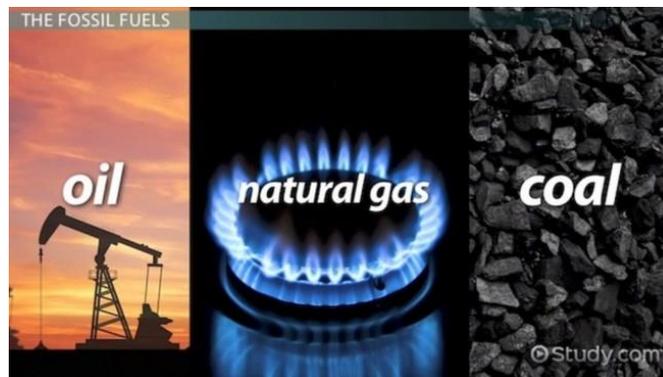




2. NONRENEWABLE SOURCES OF ENERGY = treasures that are disappearing

FOSSIL FUELS

Fossil fuels have been formed long before the time of the dinosaurs, in the geological period “Carboniferous” (approx. 300 million years ago). Dead organisms (plants and animals) have, in the natural process of anaerobic decomposition, transformed firstly into peat. After millions of years buried under heavy layers of inorganic sediments, being constantly compressed and heated, the peat has transformed to coal, oil or natural gas.



- OIL

Oil (petroleum, crude oil) is a dark, viscose, poorly flammable, liquid at ambient temperature. It contains mainly hydrocarbons (95-98%), other additives are sulphuric, oxygen and nitrogen compounds and traces of metals (iron, copper, nickel, vanadium...). 5000 years ago, Egyptians already used it for medical purposes and lighting. In the refinery more useful derivatives are processed from crude oil, such as kerosene, diesel fuel, gasoline, heating oil, paraffin wax, lubricates, asphalt and various chemicals to produce plastic. Due to the exaggerated use of such products, mainly in human transport, heating and plastic production, the negative consequences to the environment can already be observed.

- NATURAL GAS

Natural gas is a highly flammable, invisible and odourless, natural gas, consisting mainly of methane. Because of its flammability, people were often connecting natural gas with the eternal flame in honour of divinities. Today it is mainly used for heating and electricity production. Like all fossil fuels, the use of natural gas generates many greenhouse gases.

- COAL

Coal is a black or brown solid fuel, most often present in sedimentary deposits. It contains mostly carbon, but also oxygen, nitrogen and sulphur. 3000 years ago, the Chinese





thought that it was a stone that could burn. In Europe, use of coal drastically increased with the industrial revolution. It is used in thermal plants to produce electricity. Coalmines and coal-preparation plants have caused a lot of damage to the environment.

The use of fossil fuels produces carbon dioxide and other greenhouse gases. In the natural processes these gasses can be absorbed in the natural cycle but due to our modern life style this does not happen completely. Therefore, the impact on our environment can be seen in form of global warming and disappearing stocks of fossil fuels.

NUCLEAR ENERGY

Nuclear energy is the energy stored in atoms. The majority of electricity from nuclear power plants is produced by nuclear fission of uranium or plutonium. All the processes in nuclear plants are closely monitored and controlled. Otherwise, catastrophic events can arise. Today, 13% of all world's electricity is produced in nuclear plants. In regards to the environment, nuclear plants are a large threat. They produce highly radioactive waste, which is dangerous for organisms. Furthermore, the storage of radioactive waste is difficult and not safe.



SOURCES:

- *Our World in Data; Energy Production & Changing Energy Sources*
- modra-energija.si
- *STEM text book 6; Sklop Energija*
- trajnostnaenergija.si
- *encyclopedia britannica*





Learning unit 1.1 – Teaching plan

Energy sources and renewable energy

In this unit pupils discover different types of energy production sources, using all their senses through teacher guidance **optional online search tools with presentation*

TIME: 45 min

CLASS ORGANISATION: frontal, **optional group work*

METHODOLOGY: Video presentation, discussion, **optional poster or PowerPoint presentation*

LESSON GOALS:

Topic of the project: Energy sources

Pupils:

- learn what energy is and where it is used
- learn about different types and transformation processes of energy
- learn to identify production sources as non-renewable and renewable energy sources
- learn to explain pros and cons of non-renewable and renewable production sources
- search for information online and in other literature (e.g. books, textbooks)
- **optional present findings using poster or PowerPoint presentation*

MATERIALS:

- computer and projector
- presentation of the Our Solartown Energy video: <https://youtu.be/TR9Bn3TiPpM>
- 6V photovoltaic panel, small fan or toy wind wheel, crude oil in a flask, piece of coal, lighter, biomass (branches, pellets...), nuclear radiation sign, water tap (or water in a glass)
- **optional; online search engines, textbook, books, magazines*

INTRODUCTION/MOTIVATION (10 minutes):

The lesson starts with a motivational game of guessing and discussion on what pupils observed in four short videos, which are presented to the pupils. After each video the teacher should discuss the observed with the pupils. The videos present:

1. turning on the radio,
2. lighting a candle and feeling its heat,
3. a person eating meal and then running,
4. time lapse of a plant growing.

The teacher is guiding the discussion to get the pupils to think on what all four videos have in common. The teacher directs pupils to think about different types of energy and the transformation of energy from one form to another. This is what all 4 videos have in common - energy transformations. It is also important that the teacher gives a bigger picture and get pupils to think about, what using energy in everyday life means for environment.





MAIN PART (30 minutes):

The teacher writes the following headlines of a table on the blackboard:

Renewable and non-renewable sources of energy

A group of two or three pupils is standing in front of the class with their eyes closed. The teacher gives each group one of the energy sources

- to touch (coal, branches, wood chips, pellets, small photovoltaic panel, toy wind wheel),
- to smell (crude oil)
- to hear (lighter, water tap)
- to feel (wind from fan, drip water on the hand of the pupils)

and tells them to use all the senses to find out what the source is, and where it belongs in the table. The teacher is guiding the discussion about where do we find the source, their historical use, how it is used nowadays and the impact on environment and organisms.

Renewable sources	Non-renewable sources
sun (photovoltaic panel to touch)	coal (to touch)
wind (to feel the wind from fan, toy wind wheel to touch)	crude oil (to smell)
water (to listen tap water run)	natural gas (to listen the lighter)
biomass (branches, wood chips and/or pellets to touch)	nuclear power (talk about it to know the meaning of nuclear radiation sign)

**Optional group work and presentation:*

Pupils are divided into two groups. Using a computer and online search engines, they search for information on renewable and non-renewable energy sources. The teacher prepares guidelines (below) to help pupils identify what kind of information they need to search for. The information can be found by using the internet, textbooks, books, magazines etc. Pupils need to make poster or a PowerPoint presentation.

Group 1: RENEWABLE ENERGY SOURCES: Sun, Wind, Water, Biomass

Group 2: NON-RENEWABLE ENERGY SOURCES: Coal, Oil, Natural gas, Nuclear power, Description, where do we find it, historical use, how to use it, impact on environment and organisms

ASSESSMENT (5 minutes):

The assessment is left to the pupils. They should discuss about what kind of energy sources are more sustainable and why?

**Optional Findings are presented in form of a poster or PowerPoint presentation.*





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