Non-renewable and renewable energy sources

- Non-renewable and renewable energy sources
- Lesson plan (Polish)
- Lesson plan (English)

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Link to the lesson

Before you start you should know

- that saving electricity is beneficial for the environment;
- that the carbon dioxide is a greenhouse gas;
- that polluting air with exhaust fumes has a negative effect on health.

You will learn

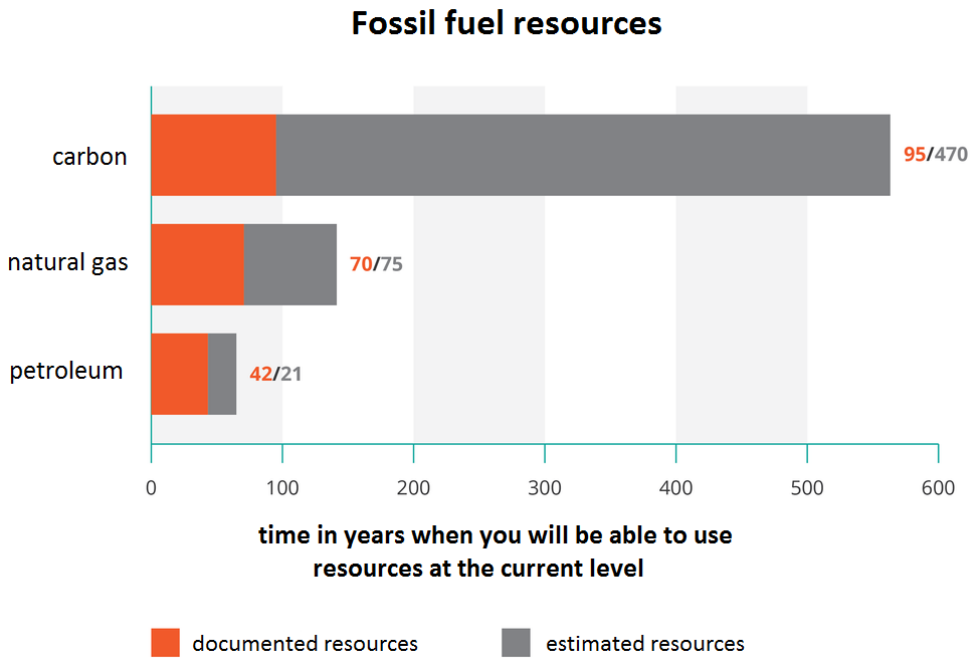
- to distinguish between renewable and non-renewable sources of electricity;
- to assess the advantages and disadvantages of various sources of electricity.

Nagranie dostępne na portalu epodreczniki.pl

Nagranie abstraktu

Non-renewable energy sources and the effects of their use

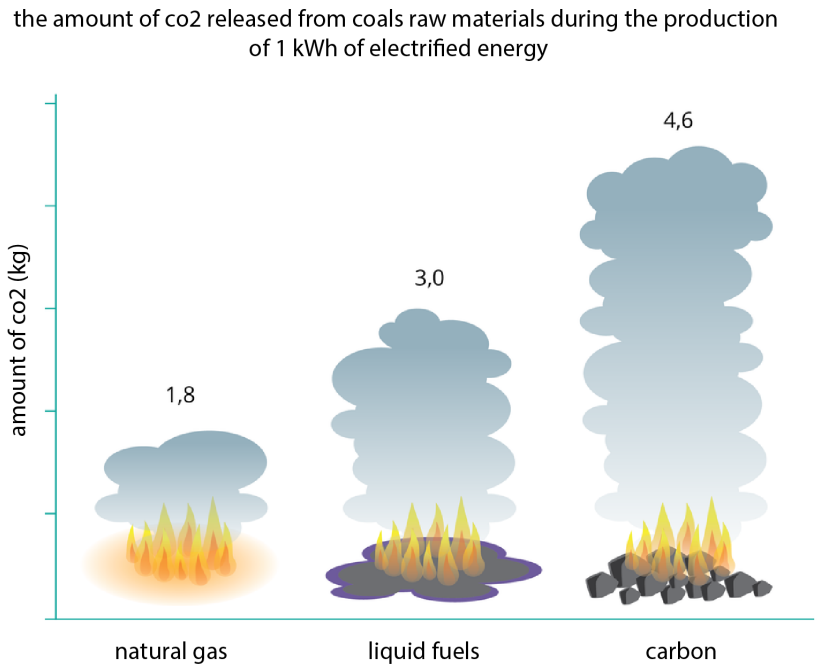
Electricity is traditionally obtained during the process of burning fossil fuel, such as **black coal**, **lignite**, **crude oil** and **natural gas**. These fuels contain carbon and carbon compounds and are of organic origin. They are called **conventional** and non-renewable natural resources.



The world's fossil fuel resources

Source: Dariusz Adryan, licencja: CC BY 3.0.

Acquiring electricity from fossil fuels is relatively efficient, but its impact on the environment is not neutral. Both the mining and burning of fossil fuels have a negative impact on nature. In the case of opencast lignite mines, whole landscapes are destroyed. It also generates a lot of waste: rocks extracted with coal as well as dusts and ashes – products of burning. In addition, during the production of energy from coal, huge amounts of carbon dioxide, sulfur oxides and other pollutants that have an adverse effect on the environment and our health are released into the atmosphere. Coal and other fuels will eventually run out. In Poland, for example, we are running out of shallow coal seams and the exploitation of deeper seams is too expensive.



The amount of carbon dioxide released from fossil fuels

Another raw material for the production of electricity is the **uranium**, used in nuclear power plants. It is estimated that the world resources are sufficient for the next 300 years. Acquiring energy from uranium is safe thanks to very restrictive regulations regarding technological processes and constantly improved production methods. The problem is the radioactive waste, which is usually put in steel barrels, covered with concrete and then placed in the deepest drifts of inactive salt mines. Waste from nuclear power plants must be safely stored for tens of thousands of years before they stop emitting harmful radiation.

> **Task 1**
>
> In Poland, energy is produced mainly from coal. Basing on the information provided above, explain what are the effects of saving electricity.

Renewable energy sources – advantages and disadvantages

Renewable energy sources include among others wind, solar energy, water energy or geothermal energy coming from inside the Earth. These sources cannot be exhausted and the power stations that generate such energy do not pollute the environment. However, the energy from these sources has its disadvantages. In the case of wind farms, the amount of obtained energy depends on the strength of the wind, so they work only when it blows, and are profitable in countries where the winds are constant and strong. In addition, wind turbines occupy large areas, change the landscape and relatively often require expensive repairs.

One of the disadvantages of hydroelectric power plants is that they are often built on dams that change the natural course of rivers and form a barrier for aquatic organisms. The amount of energy produced by hydroelectric plants depends on the water level, which, in the conditions of the observed climate change, is very variable. Still, their construction, apart from acquiring energy, may bring other benefits such as creating retention reservoirs that can be used during a drought.

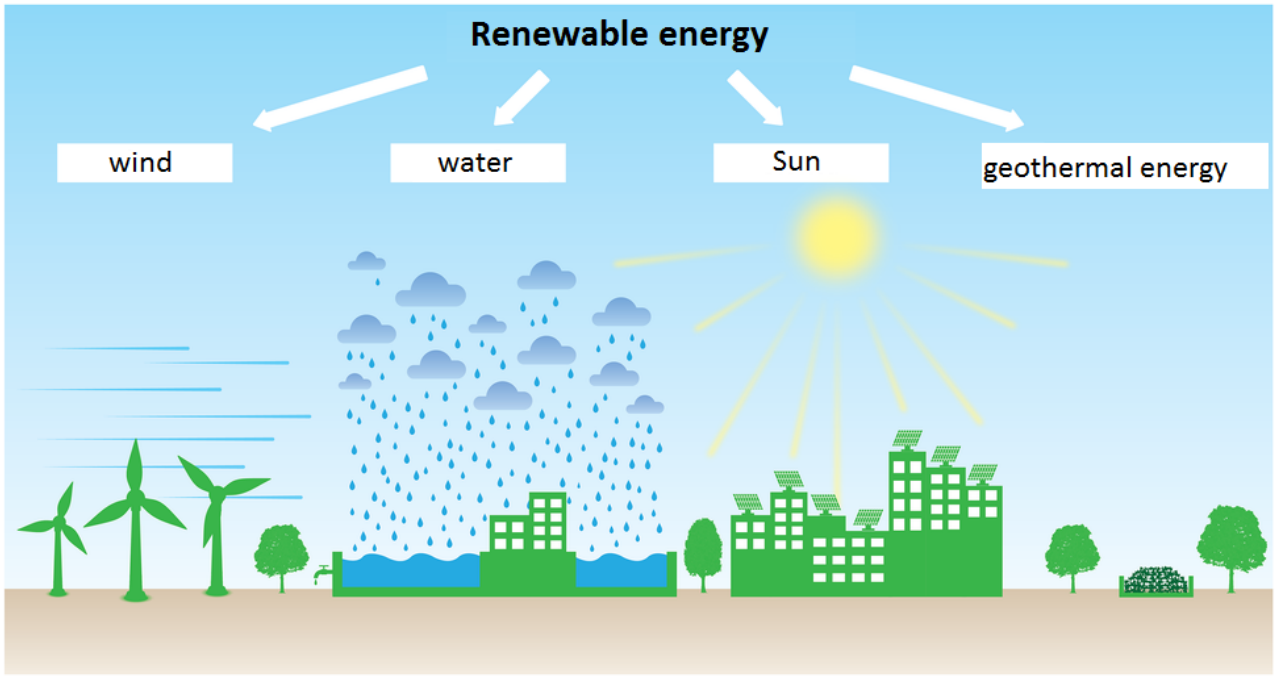
The solar and geothermal power plants are the least harmful to the environment. Solar cells, however, are profitable only in strong sunlight, and the energy of the Earth's interior can be used only in those areas where the rocks or water that accumulate heat are located relatively shallow (up to 10 km underground).

Natural conditions in Poland allow primarily for the acquisition of water and geothermal energy. However, it must be remembered that the production of energy from renewable sources is still much more expensive than acquiring it from non-renewable sources.

Geothermal power plant

Source: Fir0002, http://commons.wikimedia.org, domena publiczna.

Thanks to the multitude of the sources of renewable energy, almost every place on earth can be adapted for electricity acquisition. For example, desert areas with high sun exposure are excellent for solar plant construction, Iceland can use the geothermal energy of its hot springs, and Scotland can benefit from wind energy.



Renewable energy sources

Task 2

Before you watch the animation / slideshow „Is coal really the Black Gold?", write down the research question and the hypothesis. While watching, write down your observations and finally – conclusions.

Analysis of the show:

Research question

Hypotesis

Observations

Conclusions

Film dostępny na portalu epodreczniki.pl

Is coal really the Black Gold?

Nagranie filmowe poruszające zagadnienie: czy węgiel naprawdę jest czarnym złotem? Pojawia się plansza z tytułem Is coal really the Black Gold?, w tle żarzący się węgiel. Kolejno pojawiają się ujęcia ukazujące: wywrotka na tle hałd węgla, do której ładowany jest węgiel, wielka koparka na tle zdegradowanego środowiska, szyb kopalniany, zalany szyb kopalniany, zdegradowane środowisko po działalności kopalni odkrywkowej, zdegradowane środowisko kopalni odkrywkowej na tle fabryki z wielkimi kominami, zdegradowane środowisko po działalności kopalni odkrywkowej, industrialna część miasta z licznymi kominami produkującymi zanieczyszczenia, elektrownia z wielkimi kominami, palący się węgiel, zagaszony, dymiący węgiel, brudny dym z komina domu.

Exercise 1

Move the name of energy source to the appropriate group

lignite, natural gas, solar energy, wind, water energy, uranium, oil, geothermal energy, biomass, coal

non-renewable energy sources	
renewable energy sources	

Exercise 2

What are the negative effects of energy based on fossil fuels combustion? Identify all the correct answers.

- emission of huge amounts of carbon dioxide and other gases into the atmosphere
- generation of waste in the form of excavated rocks, as well as combustion dusts and ashes
- destruction of nature in the areas of open-pit mines and landfills
- generation of radioactive waste, which has to be adequately protected

Exercise 3

What does the term "renewable energy sources" mean?

- Sources of energy produced by man and exchanged when the previous ones are depleted (e.g. batteries, accumulators).
- Natural resources that are either inexhaustible or can undergo rapid renewal (e.g. solar energy, biomass).
- All substances that can be reused as fuel (e.g. waste paper, PET bottles).
- Natural resources that were created in the distant past and under favorable conditions could renew themselves the future (e.g. oil, coal).

Exercise 4

Enter the appropriate words in the gaps in the text.

electricity, fossil fuels, natural, non-renewable, renewable

The use of ..... energy sources should be treated as a priority by all countries. Contrary to ..... sources, based on ....., their acquisition and processing does not lead to ..... contamination. In addition, each country has at least one natural resource that can be used to produce .....

Summary

- Coal, oil, natural gas and uranium are non-renewable sources of electricity; obtaining energy from them is cheap.
- Renewable energy sources include solar radiation, wind, geothermal energy and energy coming from the flow of water; they do not pollute the environment, they won't run out,

but obtaining energy from them is expensive.
- In Poland, most of the energy comes from burning coal.
- In Poland, there are good conditions for the use of the energy of flowing water and geothermal energy.

Keywords

non-renewable energy sources, renewable energy sources, coal, energy saving

Glossary

geothermal energy

Nagranie dostępne na portalu epodreczniki.pl

Nagranie dźwiękowe słówka geothermal energy

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energia geotermalna – energia pochodząca z wnętrza Ziemi, zaliczana do odnawialnych źródeł energii

renewable energy

Nagranie dostępne na portalu epodreczniki.pl

Nagranie dźwiękowe słówka renewable energy

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energia odnawialna – energia, do uzyskania której wykorzystano zasoby przyrody, które nie ulegają wyczerpaniu, np. promieniowanie słoneczne, wiatr, energię geotermalną czy pływy morskie

fossil fuels

Nagranie dostępne na portalu epodreczniki.pl

Nagranie dźwiękowe fossil fuels

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paliwa kopalne – paliwa powstałe w wyniku beztlenowych procesów zachodzących pod ogromnym ciśnieniem we wnętrzu Ziemi; zaliczamy do nich m.in. węgiel kamienny,

węgiel brunatny, ropę naftową oraz gaz ziemny

Lesson plan (Polish)

Nieodnawialne i odnawialne źródła energii

Autor: Leokadia Stalewicz

Adresat

Uczniowie klasy VIII szkoły podstawowej

Podstawa programowa

Wymagania ogólne

IV. Rozumowanie i zastosowanie nabytej wiedzy do rozwiązywania problemów biologicznych. Uczeń:

1. interpretuje informacje i wyjaśnia zależności przyczynowo-skutkowe między zjawiskami, formułuje wnioski;

2. przedstawia opinie i argumenty związane z omawianymi zagadnieniami biologicznymi.

Ogólny cel kształcenia

Poznasz zalety i wady odnawialnych oraz nieodnawialnych źródeł energii

Kompetencje kluczowe

- porozumiewanie się w językach obcych;
- kompetencje informatyczne;
- umiejętność uczenia się.

Kryteria sukcesu
Uczeń nauczy się:

- rozróżniać odnawialne i nieodnawialne źródła energii elektrycznej;
- oceniać zalety i wady różnych źródeł energii elektrycznej.

Metody/techniki kształcenia

- **podające**
    - pogadanka.
- **aktywizujące**
    - dyskusja.
- **eksponujące**
    - pokaz.

- **programowane**
    - z użyciem komputera;
    - z użyciem e-podręcznika.
- **praktyczne**
    - ćwiczeń przedmiotowych.

Formy pracy

- praca indywidualna;
- praca w parach;
- praca w grupach;
- praca całego zespołu klasowego.

Środki dydaktyczne

- e-podręcznik;
- zeszyt i kredki lub pisaki;
- tablica interaktywna, tablety/komputery.

Przebieg lekcji

Przed lekcją

- Uczniowie zapoznają się z treścią abstraktu. Przygotowują się do pracy na lekcji w taki sposób, żeby móc przeczytany materiał streścić własnymi słowami i samodzielnie rozwiązać zadania.

Faza wstępna

- Nauczyciel podaje temat, cele lekcji i kryteria sukcesu sformułowane w języku zrozumiałym dla ucznia.
- Następnie zapisuje na tablicy lub tablicy interaktywnej temat lekcji. Uczniowie notują go w zeszytach.
- Prowadzący przypomina uczestnikom zajęć, jakiego obszaru tematycznego będzie dotyczyła lekcja.

Faza realizacyjna

- Nauczyciel prosi uczniów, aby samodzielnie przeczytali abstrakt, zwracając szczególną uwagę na grafiki.
- Prowadzący dzieli klasę na kilka grup, których zadaniem jest przygotowanie zestawienia zalet i wad odnawialnych oraz nieodnawialnych źródeł energii. Uczniowie pracują metodą stolików eksperckich, przy czym przy każdym stoliku jest analizowane jedno z poniższych zagadnień: konsekwencje korzystania z nieodnawialnych źródeł energii opartych na spalaniu paliw kopalnych; konsekwencje korzystania z nieodnawialnych

źródeł energii opartych na rozszczepieniu uranu; zalety i wady elektrowni wiatrowych oraz elektrowni wodnych; zalety i wady elektrowni słonecznych i geotermalnych.
- Nauczyciel wyznacza grupę, która przedstawi zestawienie zalet i wad poszczególnych źródeł energii. Przedstawiciel grupy referuje wyniki pracy. Uczniowie z pozostałych grup w miarę potrzeby uzupełniają jego wypowiedź.
- Pracując w tych samych grupach uczniowie dyskutują nad tym jakie skutki przynosi oszczędzanie energii elektrycznej (przy uwzględnieniu faktu, iż w Polsce energię produkuje się głównie z węgla). Następnie zapisują wnioski w zeszytach.
- Uczniowie samodzielnie wykonują zamieszczone w abstrakcie ćwiczenia interaktywne sprawdzające stopień opanowania wiadomości poznanych w czasie lekcji. Nauczyciel inicjuje dyskusję, w trakcie której omówione zostają prawidłowe rozwiązania wszystkich ćwiczeń samodzielnie wykonanych przez uczniów.

Faza podsumowująca

- Na zakończenie zajęć nauczyciel pyta: Gdyby z przedstawionego na lekcji materiału miałaby odbyć się kartkówka, jakie pytania waszym zdaniem powinny zostać zadane? Gdyby uczniowie nie wyczerpali najistotniejszych zagadnień, nauczyciel może uzupełnić ich propozycje.

Praca domowa

- Wyobraź sobie, że masz okazję przeprowadzić wywiad z naukowcem – specjalistą w dziedzinie, której dotyczyła dzisiejsza lekcja. Jakie pytania chciałbyś mu zadać? Zapisz je.

W tej lekcji zostaną użyte m.in. następujące pojęcia oraz nagrania

Pojęcia

> **geothermal energy**
>
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> Nagranie dźwiękowe słówka geothermal energy
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Nagranie dźwiękowe słówka renewable energy

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fossil fuels

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Nagranie dźwiękowe fossil fuels

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Teksty i nagrania

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Nagranie abstraktu

Non-renewable and renewable energy sources

Electricity is traditionally obtained during the process of burning fossil fuel, such as **black coal**, **lignite**, **crude oil** and **natural gas**. These fuels contain carbon and carbon compounds and are of organic origin. They are called **conventional** and non-renewable natural resources.

Acquiring electricity from fossil fuels is relatively efficient, but its impact on the environment is not neutral. Both the mining and burning of fossil fuels have a negative impact on nature. In the case of opencast lignite mines, whole landscapes are destroyed. It also generates a lot of waste: rocks extracted with coal as well as dusts and ashes – products of burning. In addition, during the production of energy from coal, huge amounts of carbon dioxide, sulfur oxides and other pollutants that have an adverse effect on the environment and our health are released into the atmosphere. Coal and other fuels will eventually run out. In Poland, for example, we are running out of shallow coal seams and the exploitation of deeper seams is too expensive.

Another raw material for the production of electricity is the **uranium**, used in nuclear power plants. It is estimated that the world resources are sufficient for the next 300 years.

Acquiring energy from uranium is safe thanks to very restrictive regulations regarding technological processes and constantly improved production methods. The problem is the radioactive waste, which is usually put in steel barrels, covered with concrete and then placed in the deepest drifts of inactive salt mines. Waste from nuclear power plants must be safely stored for tens of thousands of years before they stop emitting harmful radiation.

Renewable energy sources include among others wind, solar energy, water energy or geothermal energy coming from inside the Earth. These sources cannot be exhausted and the power stations that generate such energy do not pollute the environment. However, the energy from these sources has its disadvantages. In the case of wind farms, the amount of obtained energy depends on the strength of the wind, so they work only when it blows, and are profitable in countries where the winds are constant and strong. In addition, wind turbines occupy large areas, change the landscape and relatively often require expensive repairs.

One of the disadvantages of hydroelectric power plants is that they are often built on dams that change the natural course of rivers and form a barrier for aquatic organisms. The amount of energy produced by hydroelectric plants depends on the water level, which, in the conditions of the observed climate change, is very variable. Still, their construction, apart from acquiring energy, may bring other benefits such as creating retention reservoirs that can be used during a drought.

The solar and geothermal power plants are the least harmful to the environment. Solar cells, however, are profitable only in strong sunlight, and the energy of the Earth's interior can be used only in those areas where the rocks or water that accumulate heat are located relatively shallow (up to 10 km underground).

Natural conditions in Poland allow primarily for the acquisition of water and geothermal energy. However, it must be remembered that the production of energy from renewable sources is still much more expensive than acquiring it from non-renewable sources.

Thanks to the multitude of the sources of renewable energy, almost every place on earth can be adapted for electricity acquisition. For example, desert areas with high sun exposure are excellent for solar plant construction, Iceland can use the geothermal energy of its hot springs, and Scotland can benefit from wind energy.

- Coal, oil, natural gas and uranium are non-renewable sources of electricity; obtaining energy from them is cheap.
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- In Poland, most of the energy comes from burning coal.
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Lesson plan (English)

Non-renewable and renewable energy sources

Author: Leokadia Stalewicz

Target group

8th-grade students of elementary school

Core curriculum

General requirements

IV. Reasoning and applying the acquired knowledge to solving biological problems. The student:

1. interprets the information and explains causal relationships between phenomena, formulates conclusions;

2. presents opinions and arguments related to the discussed biological issues.

General aim of education

You will learn the advantages and disadvantages of renewable and non-renewable energy sources

Key competences

- communication in foreign languages;
- digital competence;
- learning to learn.

Criteria for success
The student will learn:

- distinguish renewable and non-renewable sources of electricity;
- assess the advantages and disadvantages of various sources of electricity.

Methods/techniques

- **expository**
    - talk.
- **activating**
    - discussion.
- **exposing**

    - exposition.
- **programmed**
    - with computer;
    - with e-textbook.
- **practical**
    - exercices concerned.

Forms of work

- individual activity;
- activity in pairs;
- activity in groups;
- collective activity.

Teaching aids

- e-textbook;
- notebook and crayons/felt-tip pens;
- interactive whiteboard, tablets/computers.

Lesson plan overview

Before classes

- Students get acquainted with the content of the abstract. They prepare to work on the lesson in such a way to be able to summarize the material read in their own words and solve the tasks themselves.

Introduction

- The teacher gives the topic, the goals of the lesson in a language understandable for the student, and the criteria of success.
- Then he writes the subject of the lesson on the blackboard or interactive whiteboard. Students write it in notebooks.
- The teacher reminds the participants of the classes what subject area the lesson will concern.

Realization

- The teacher asks students to read the abstract themselves, paying particular attention to the illustrations.
- The teacher divides the class into several groups whose task is to prepare a summary of the advantages and disadvantages of renewable and non-renewable energy sources. Students work using the expert tables method, with each table examining one of the following issues: consequences of using non-renewable energy sources based on burning fossil fuels; the consequences of using non-renewable energy sources based on

uranium fission; advantages and disadvantages of wind farms and hydroelectric power plants; advantages and disadvantages of solar and geothermal plants.
- The teacher designates a group that will present a list of advantages and disadvantages of individual energy sources. The representative of the group reports the results of the work. Students from other groups supplement his speech as needed.
- Working in the same groups, students discuss the effects of saving electricity (taking into account the fact that in Poland energy is mainly produced from coal). Then they write the conclusions in the notebooks.
- Students carry out the interactive exercises checking the level of knowledge learned during the lesson. The teacher initiates a discussion during which the correct solutions for all the exercises performed by the students are discussed.

Summary

- At the end of the lesson the teacher asks: If there was going to be a test on the material we have covered today, what questions do you think would you have to answer? If the students do not manage to name all the most important questions, the teacher may complement their suggestions.

Homework

- Imagine that you have the opportunity to interview an academic - a specialist in the field of today's lesson. What questions would you like to ask him? Write them down.

The following terms and recordings will be used during this lesson

Terms

> **geothermal energy**
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Texts and recordings

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