CZYSTA MOC ENERGII

LESSON TOPIC

What is energy transition – and why is it important?

Grades **8**
Time **45 min.**

The lesson plan for eighth-grade elementary school students was prepared by Jakub Wiech, a lawyer, journalist, and columnist specializing in energy, editor-in-chief of the Energetyka24.com portal, popularizer of knowledge in this field, and author of the podcast "Elektryfikacja"

OBJECTIVES IN LINE WITH THE CORE CURRICULUM

in the field of general education:

- The student understands what energy transition is;
- The student understands the impact of energy on the climate and everyday life;
- Students develop critical thinking and teamwork skills.

INTRODUCTION

The teacher asks the students to describe what they think Poland's energy mix looks like.

The energy mix is a breakdown of the shares of individual energy sources in a given system (e.g. the national system). The energy mix may refer to installed capacity (i.e. the distribution of individual energy sources installed in the system) or energy generated or consumed (i.e. the product of installed sources). For example, in terms of Poland's energy mix in 2024, renewable energy sources accounted for as much as 48% of installed capacity, and coal for 40%. However, in terms of energy generated, coal accounted for 56% and renewable energy sources for 29%. This is because RES sources (e.g. wind turbines, photovoltaic panels) have a lower installed capacity utilisation rate.

PART 1

The teacher discusses Poland's current energy situation.

Poland's energy mix – installed capacity (2024)

Energy source	Installed capacity [GW]
Hard coal	18,53
Photovoltaics	17,71
Onshore wind farms	10,29
Lignite	6,95
Natural gas	5,25
Pumped storage power plants	1,52
Other sources	1,80
Hydroelectric power plants – reservoir	0,47
Coke oven gas (from coal)	0,47
Hydroelectric power plants – run-of-river	0,32
Biomass	0,64
Fuel oil power plants	0,39

Poland's energy mix – energy produced (2024)

Energy source	Energy produced [TWh]
Hard coal	56,17
Lignite	32,90
Onshore wind farms	23,92
Photovoltaics	17,34
Natural gas	16,51
Other sources	3,17
Energy imports and exports (cross-border trade)	2,48
Biomass	2,36
Crude oil	2,04
Coke oven gas (from coal)	1,05
Hydroelectric power plants – run-of-river	1,53
Pumped storage power plants	1,13
Hydroelectric power plants – reservoir	0,34
Other renewable energy sources (e.g. biogas)	0,21

This is the present-day energy situation in Poland, however, it is changing rapidly because of the energy transition.

LECTURE

PART 2

Why is Poland undergoing an energy transition?

There are many reasons why Poland is undergoing an energy transition: global, regional and domestic. It is worth highlighting the most important ones.

1.

The whole world is moving towards an energy transition

The energy transition, which involves moving away from fossil fuels and switching to zero-emission sources, is a global trend. In 2024 alone, more than USD 2 trillion was spent on this globally, although 20 years ago, this expenditure did not exceed USD 200 billion.

A trillion is a very large number – a trillion is a thousand billion. To imagine this number, you can think of it this way: a million seconds is less than two weeks. A billion seconds is about 30 years. A trillion seconds is 30,000 years. So a million seconds ago is two weeks ago, and a trillion seconds ago is the late Palaeolithic era.

China is currently leading the energy transition, with the most capacity in photovoltaic panels, wind turbines and nuclear power plants being built in the country worldwide. This is slowly becoming apparent in China's emissions results – in the first quarter of 2025, Chinese emissions fell by approximately 1.6% compared to the first quarter of 2024. This decline was caused precisely by the energy transition, as energy consumption in China increased at the same time.

The energy transition is also being carried out by, among others, the United States (where emissions and the share of coal in the energy mix have been falling for years), India (which wants to significantly increase the share of nuclear power in its energy mix) and, of course, the European Union. The global goal of this transition is to achieve climate neutrality. This is to enable global warming to be limited to 2 degrees Celsius compared to the global average temperature in the pre-industrial era – a task set out, among others, by the Paris Agreement.

2.
The world must change to save the climate

Humanity is undergoing an energy transition to combat climate change. Climate change is caused by human activity, primarily the burning of fossil fuels, which releases huge amounts of greenhouse gases, such as carbon dioxide, into the atmosphere. The scale of these emissions is enormous: every year, approximately 35 billion tonnes of CO2 (whose atmospheric concentration has doubled over the last 200 years), as well as other gases such as methane. These substances act like a blanket over our planet – they trap heat in the atmosphere, leading to an increase in average temperatures on Earth. The effects of this process are already visible: increasingly frequent droughts, violent storms, fires, rising sea levels and melting glaciers.

A dangerous pace – the biggest problem with current climate change is its pace. Global warming and cooling have occurred on Earth before, but never so rapidly. Current climate change is about 30-50 times faster than the fastest natural changes in the past. Such a rapid pace makes it impossible for both nature and humans to adapt.

Humanity must therefore reduce emissions, otherwise these changes will continue, threatening agriculture, access to water and the security of billions of people. That is why the world is now investing in nuclear energy, renewable energy sources and energy efficiency – to halt the disaster before it spirals out of control.

3.
Energy transition is business

The energy transition is an opportunity to build new sectors of the economy and competitive advantages. This is very clear on a global scale, where for every dollar invested in fossil fuels, two dollars are already being spent on zero-emission technologies – and this ratio is improving year on year in favour of clean energy. The effects of this process are also visible in Poland. For example, the photovoltaic sector employs around 40,000 people in Poland, the battery sector generates imports worth PLN 40 billion, and investments in offshore wind farms will reach around PLN 200 billion and create thousands of new jobs. In turn, each gigawatt of power built in the nuclear energy sector will involve the creation of approximately 10,000 new jobs and Poland is planning to build between 6 and 9 GW of nuclear power.

4.
Change in supply chains

The energy transition is also an opportunity to change supply chains, which can sometimes be very costly and cumbersome. For example, since 2000, Poland has spent approximately PLN 1.7 trillion on imports of energy resources and fuels. This money has gone to countries such as Russia that are waging aggressive wars. Meanwhile, if the transition were to reduce these expenses by just 10%, the Polish economy would save PLN 170 billion, which is the estimated cost of Poland's first nuclear power plant.

What is more, such a change in supply chains also protects against energy crises, such as the one in 2022. At that time, Europe had to inject around EUR 1 trillion (nearly PLN 4.5 trillion) into the market to help energy consumers affected by high bills. This happened because the European Union is heavily dependent on energy imports, sourcing 75% of its coal, 90% of its gas and 97% of its fuels and oil from outside the EU.

5.

The financial burdens of climate policy

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6.

Poland's ageing energy sector and unprofitable mining industry

The energy transition in Poland is being driven not only by climate change, the economy and politics, but also by the harsh reality of Poland's energy sector which is outdated and simply beginning to fall apart. The average age of coal-fired power units is around 50 years, and many of them should have been retired long ago. Failure rates are rising, as are maintenance costs, and access to domestic coal is becoming increasingly unstable and expensive – extracting 1 tonne of thermal coal from Polish mines currently costs an average of PLN 920, while imported coal is significantly cheaper (by about half). In 2024 alone, the Polish coal mining industry generated a loss of almost PLN 12 billion, and in 2025, Polish taxpayers will subsidise this sector with PLN 9 billion, or PLN 1 million per hour.

7.

Better air quality

The energy transition is not only a rescue for the climate, but also a relief for the lungs. By moving away from burning coal and other fossil fuels, emissions of harmful substances such as particulate matter, sulphur oxides and nitrogen oxides, which poison the air in cities and smaller towns, are significantly reduced. These pollutants are the main cause of many respiratory diseases, from asthma to chronic obstructive pulmonary disease, and also increase the risk of strokes, heart attacks and cancer. Meanwhile, it is estimated that as many as 40,000 people in Poland die prematurely every year due to air pollution.

EXERCISES

PART 3

TASK 1

The teacher divides the class into groups (4-5 people each). The task for each group is to design an energy transition plan for Poland with the aim of achieving climate neutrality by 2050.

Climate neutrality – a state of the economy in which only as much CO_2 (and other gases) is emitted as nature or technology can absorb – e.g. through forests, soil or special devices. The point is not to have no emissions at all, but to have a net zero balance. It's a bit like a household budget – you can spend money, but you have to balance it out with income.

TASK 2

The teacher divides the class into groups (4-5 people each). The task for each group is to identify potential problems that may be associated with the energy transition and to propose solutions.

SUMMARY

PART 4

Recapitulate the knowledge gained and consolidate it through discussion.