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N. V. Klymyshen
N. V. Herasymenko

THE IMPACT OF ENERGY ON CLIMATE CHANGE

Vinnytsia National Technical University

Анотація
У статті розглядаються сучасні проблеми, пов'язані з кліматичними змінами, одним з чинників яких є енергетика. Також тут описується як можна запобігти подальшому погіршенню ситуації з кліматом у світі.
Ключові слова: енергетика, клімат, глобальне потепління, парниковий ефект, парникові гази, паливні ресурси, зелена енергетика, кліматичні зміни.

Abstract
The article examines current problems related to climate change, one of the factors of which is energy. It also describes how to prevent further deterioration of the global climate situation.
Keywords: energy, climate, global warming, greenhouse effect, greenhouse gases, fuel resources, green energy, climate change.

Introduction

Global climate change has become one of the most urgent environmental problems, the solution of which is focused on humanity. Its consequences are dangerous weather disasters, sudden changes in weather, floods, floods, strong winds, downpours and rains, hail, droughts, which lead to significant environmental and economic losses around the world. According to the World Meteorological Organization, the last three years have been the three warmest years in the history of observation. Increasing unpredictability of weather conditions threatens food production, and rising sea levels increase the risk of natural disasters [1].

Energy is a major contributor to climate change, as the burning of fossil fuels (coal, gas, oil) for energy production causes greenhouse gas emissions, which exacerbate the greenhouse effect and raise the Earth's temperature. This leads to extreme weather events, the destruction of ecosystems, and requires an urgent transition to renewable energy sources.

Energy production and consumption form the basis of socio-economic development, but it still remains the main source of anthropogenic greenhouse gas emissions that cause global warming. This situation creates various discussions among scientists about how to prevent climate change.

Causes of climate change

The main cause of global warming is the greenhouse effect, which is exacerbated by emissions of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and other greenhouse gases [3].

The largest sources of these emissions are [3]:

- Burning fossil fuels (coal, oil, gas) to produce electricity, transport, and heating.
- Industry and agriculture, especially livestock.
- Deforestation, which reduces the planet's natural ability to absorb CO_2.

Consequences of climate change [3]:

- Increase in average temperature on the planet
- Rising sea levels due to melting glaciers
- Abnormal climatic phenomena (hurricanes, downpours, droughts)
- Reduced yields, water supply problems
- Extinction of species, disruption of ecosystems

In addition to the direct impact on the atmosphere, energy activities are accompanied by negative environmental consequences associated with the extraction, transportation and processing of fuel resources. This leads to land degradation, pollution of water bodies and disruption of ecosystems, which indirectly affects climate processes.

At the beginning of the 21st century, about 80 percent of the world's energy supply was derived from fossil fuels such as coal, petroleum, and natural gas. Fossil fuels are finite resources; most estimates suggest that the proven reserves of oil are large enough to meet global demand at least until the middle of the 21st century. Fossil fuel combustion has a number of negative environmental consequences. Fossil-fueled power plants emit air pollutants such as sulfur dioxide, particulate matter, nitrogen oxides, and toxic chemicals (heavy metals: mercury, chromium, and arsenic), and mobile sources, such as fossil-fueled vehicles, emit nitrogen oxides, carbon monoxide, and particulate matter. Exposure to these pollutants can cause heart disease, asthma, and other human health problems. In addition, emissions from fossil fuel combustion are responsible for acid rain, which has led to the acidification of many lakes and consequent damage to aquatic life, leaf damage in many forests, and the production of smog in or near many urban areas. Furthermore, the burning of fossil fuels releases carbon dioxide (CO_2), one of the main greenhouse gases that cause global warming [2].

Ways to solve the problem

Climate change has long ceased to be a theoretical threat - it is a reality that humanity is experiencing here and now. Rising global temperatures, melting glaciers, abnormal weather events, droughts, floods, forest fires – all these are consequences of excessive greenhouse gas emissions, most of which are caused by traditional energy. That is why green energy is now considered a key tool in the fight against climate change.

Active implementation of renewable energy sources – solar, wind, hydro and bioenergy – ensures reduction of greenhouse gas emissions and contributes to the formation of a low-carbon energy system. An additional factor in reducing emissions is increasing energy efficiency through modernization of equipment, development of smart grids and optimization of energy consumption.

Nuclear power plays a special role in the context of energy decarbonization, as it is characterized by low greenhouse gas emissions during operation. Provided that nuclear and environmental safety requirements are met, it can be considered a stable source of electricity in the transition period to full decarbonization.

Thus, the energy sector is both a major driver of climate change and a key area for its mitigation. Implementing a sustainable energy development strategy focused on decarbonization, energy efficiency, and the introduction of innovative technologies is a necessary condition for reducing the anthropogenic impact on the climate and ensuring long-term environmental security.

To reduce reliance on petroleum-based fuels, particularly for heavy-duty vehicles and airplanes, one potential solution is biofuels. Biofuels are produced by breaking down plant material and converting it into usable fuels, such as ethanol or biodiesel. Corn ethanol is already added to gas to cut down on greenhouse gas emissions. However, creating ethanol is not a zero-carbon process, and supplementing with corn ethanol averages just under 40 percent lower carbon emissions than using only gasoline. Corn ethanol also relies on land which could be used for growing other food crops. Researchers are currently studying how to use invasive plants, as well as plants that require little water, fertilizer, or land to grow, to create the next generation of biofuels. Some promising plant feedstock options include hemp, switchgrass, carrizo cane, jatropha shrubs, and algae. New biotechnologies are also being studied to develop more efficient ways to break down biomass into sugars, which microbes then convert into biofuels. There is also ongoing research to create microbes that can directly convert plants to biofuels, and to enable microbes to produce long-chain, energy-dense hydrocarbons that could be used to fuel heavy-duty vehicles and airplanes [4].

Conclusion

Therefore, the future of humanity depends on the ability to implement a sustainable development model, where energy ceases to be a destructive factor for the climate. The transition to "green" energy is not just a technological task, but a critical condition for preserving the biosphere and ensuring environmental safety for future generations.

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Климишен Микола Володимирович **–** студент групи ЕЕ-23б, факультет електроенергетики та електромеханіки, Вінницький національний технічний університет, Вінниця, email: nickklymyshen@gmail.com.

Науковий керівник: ***Надія Валеріївна Герасименко*** – викладач англійської мови кафедри іноземних мов Вінницького національного технічного університету, Вінниця.

Nick Volodymyrovych Kymyshen – student of group EE-23b, faculty of Power Engineering and Electromechanics, Vinnytsia National Technical University, Vinnytsia, email: nickklymyshen@gmail.com.

Supervisor: ***Nadiia Valeriivna Herasymenko*** – English teacher, Department of Foreign Languages, Vinnytsia National Technical University, Vinnytsia.