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DEFINITION AND IMPORTANCE OF NATURAL GAS IN THE ENERGY SECTOR

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Abstract

The article is devoted to analyzing the role of natural gas as one of the key energy sources in the modern world. It considers the main characteristics of natural gas, its composition and methods of production, as well as its place in the overall energy balance of countries. The author emphasizes the importance of natural gas for energy security, its environmental advantages over other fossil fuels, and its potential for use in the transition to more sustainable energy sources. The article also discusses trends in the natural gas industry, including innovative technologies, such as natural gas liquefaction (LNG) and transportation methods, that are increasing access to this resource in international markets. It also examines the challenges and prospects facing the natural gas sector in the face of global climate change and the transition to a low-carbon economy. The article is intended for energy professionals, environmentalists, and a general audience interested in sustainability and energy policy.

Keywords: *natural gas, energy security, natural gas reserves, liquefied natural gas (LNG).*

Introduction. Natural gas is one of the most significant energy sources in the world today, playing a key role in the global energy mix. With the increasing need for clean and efficient energy sources, natural gas is becoming an increasingly attractive choice for countries seeking to reduce carbon emissions and reduce their dependence on coal and oil. Unlike other fossil fuels, natural gas offers several environmental advantages, including lower carbon dioxide emissions from combustion and no sulfur, making it an important component in the transition to sustainable energy systems.

The definition of natural gas encompasses its chemical composition, physical properties and extraction methods. It consists predominantly of methane (CH4) and can be found either in its free state or as part of hydrocarbon deposits. Natural gas is used not only for power generation, but also in industry, for heating and as a raw material for the chemical industry. This article will examine the importance of natural gas in the energy sector, its role in ensuring the energy security of countries, as well as its impact on the economy and the environment. We will analyze current trends in the development of the natural gas industry, including innovative technologies and transportation methods that contribute to increasing access to this important resource. Thus, the article aims to provide a thorough understanding of the place of natural gas in today's energy landscape and its importance for sustainable development. This article utilizes various sources of information including.

Materials. Research articles and studies: Analyzing existing publications on the topic of natural gas, its definition and its role in the energy sector. This includes works on the environmental aspects of natural gas, its economic benefits, and production and transportation technologies. Statistics: Using official statistics on natural gas production, consumption and imports in various countries. These data allow the importance of natural gas in the energy mix to be assessed. Reports from international organizations: Review of reports from organizations such as the International Energy Agency (IEA) and the World Bank that provide information on natural gas market trends and their impact on global energy. Regulatory Analysis: Examination of legislation and regulations pertaining to the use of natural gas in different countries, which helps in understanding the legal framework and conditions for its use.

Methods. The following methods were applied to achieve the objectives of the study:

Analytical method: Systematic analysis of collected data and information from various sources to identify key aspects of the definition and importance of natural gas in the energy sector.

Benchmarking: Comparison of the role of natural gas in different countries to identify best practices and approaches to its utilization.

Case Studies: Examination of case studies of successful natural gas applications in the energy sector, including innovative technologies and transportation methods.

Economic Analysis: Evaluate the economics associated with natural gas use, including the cost of its production, transportation and consumption in different sectors of the economy.

Forecasting: Using forecasting techniques to assess future trends in natural gas utilization in the energy sector, taking into account changes in policy, technology, and consumer preferences.

These materials and methods provide a deeper understanding of the importance of natural gas in today's energy sector and its impact on sustainable economic development.

Results obtained. This article analyzed key aspects of the definition and importance of natural gas in the energy sector, focusing on its role as a major energy source, as well as current trends and statistics related to gas production and consumption.

Natural gas is defined as a fossil fuel consisting mainly of methane (CH_4), which is used in various sectors of the economy, including electricity, industry and domestic consumption. It is an important component of the energy mix of many countries due to its high energy efficiency and lower environmental impact than other fossil fuels.

Natural gas is central to the global energy system. It provides more than 25% of the world's energy consumption and is the main source of electricity for many countries. In Uzbekistan, for example, more than 80% of electricity is generated from natural gas, underscoring its critical importance to the country's energy security. The following statistics were used to illustrate the importance of natural gas in the energy sector: Natural gas production in Uzbekistan: In 2021, 53.8 billion cubic meters of natural gas was produced. In 2022, production was 51.6 billion cubic meters. In 2023, production decreased to 46.7 billion cubic meters, a decrease of 9.6% from the previous year.[1]

Natural Gas Reserves: As of August 2023, Uzbekistan's proven natural gas reserves are approximately 1.85 trillion cubic meters, placing the country as the world's 17th largest natural gas reserve. [1] Energy dependence: more than 90% of the country's electricity generation comes from natural

gas. A drop in its production negatively affects electricity generation and can lead to mass blackouts The results of the study show that natural gas plays a key role in ensuring energy security and sustainable development of Uzbekistan's economy. Given the decline in production, it is necessary to develop strategies to optimize the use of this resource and improve the efficiency of gas supply. Application of innovative technologies and attraction of investments can be important steps to improve the situation in the gas sector of the country.

Discussion. This article discusses the key role of natural gas as a critical energy source in the modern world. Natural gas, consisting predominantly of methane, is used in a multitude of sectors including power generation, industry and domestic consumption. Its environmental advantages over other fossil fuels make it an attractive choice for countries seeking to reduce carbon emissions and transition to cleaner energy sources.

Natural gas production in Uzbekistan has been steadily declining in recent years. From 2010 to 2023, the decline was about 30%, equivalent to a loss of about 19.2 billion cubic meters of gas.[3]

This decline is due to the depletion of existing fields and a lack of investment in new developments and technologies. As a result, the country is faced with the need to import gas, jeopardizing its energy independence. About 53.8 billion cubic meters of gas was planned to be produced in 2021, but the actual volumes were lower than expected. This poses serious challenges to the country's energy security and requires the development of effective strategies to increase production and optimize resource utilization."[2]

Natural gas is critical to Uzbekistan's energy security. Declining production and growing domestic demand are leading to increased dependence on imports, which could negatively affect the country's economy and foreign economic relations. Gas imports from Russia have already become a reality, which emphasizes the need to find solutions to increase domestic production and reduce dependence on external supplies. [3] Analysis of statistical data shows a significant decline in natural gas production in Uzbekistan in recent years. In 2021, 53.8 billion cubic meters of gas was produced, in 2022 it was 51.6 billion cubic meters, and in 2023 this figure dropped to 46.7 billion cubic meters. This was a decrease of 9.6% from the previous year and over 13% from the 2018 peak.[3]

The data shows that Uzbekistan has become a net importer of gas, which emphasizes the need to find new approaches to ensure the country's energy security. The drop in production is not only due to the natural depletion of fields, but also due to insufficient investment in infrastructure modernization. The drop in natural gas production in Uzbekistan is due to several key factors that are interrelated and affect the state of the country's gas industry.

Let us consider the main ones: One of the main reasons for the decline in production is the depletion of existing gas fields. According to experts, about 75-80% of the fields in operation have already been depleted. This leads to a decrease in production volumes, as new reserves do not have time to compensate for the loss of old ones. Technological losses in gas production also play a significant role in the decline in volumes. In particular, the Energy Minister points out that most of the losses are attributable to Uzbekneftegaz, which requires the introduction of new technologies and methods to improve production efficiency.

Delayed commissioning of new gas field development projects and infrastructure modernization also negatively affects production volumes. Numerous initiatives have been planned in recent years, but many of them have not been implemented on time, exacerbating the situation in the gas market. Economic conditions and domestic gas prices are formed in a non-market way and remain lower than imported gas prices. This creates additional difficulties for investors and reduces the attractiveness of the sector for investments. As a result, the lack of investment makes it difficult to modernize equipment and technologies. Declining gas consumption is also an important factor affecting gas production. According to statistics, gas consumption in Uzbekistan has started to decline after a long period of growth: from 51.9 billion cubic meters in 2021 to 48.6 billion cubic meters in 2022. This can be attributed to the shift to alternative energy sources and changing consumption patterns.

The COVID-19 pandemic also had an impact on the gas market, especially in 2020, when there was a sharp drop in demand from China and a suspension of supplies to Russia. This led to temporary difficulties in the natural gas industry and a further decline in production. Thus, the decline in natural gas production in Uzbekistan is caused by a complex of factors, including field depletion, technological losses, delays in new projects, economic conditions and declining consumption. To stabilize the situation, it is necessary to develop effective gas industry management strategies aimed at attracting investment and introducing innovative technologies.

The role of natural gas in the energy balance can be explained by the fact that natural gas accounts for more than 80% of the total electricity production in Uzbekistan. This makes it critical for ensuring the stability of energy supply. However, declining production volumes lead to a shortage of gas on the domestic market and mass blackouts during peak demand periods. According to the Statistics Agency, Uzbekistan's population has increased by 3.6 million people over the past six years, which requires an increase in energy consumption by at least 10-15%. This puts additional pressure on the country's gas industry.[4] Natural gas is a cleaner source of energy compared to coal and oil. Its use helps to reduce the emission of carbon dioxide and other pollutants.

However, to achieve sustainable development, it is necessary to invest in new technologies and improve the efficiency of natural gas utilization. Economic aspects also play an important role: lowering tax rates on natural gas and other hydrocarbons can help attract investment in the sector. However, it can also lead to a shortfall in budget revenues, which requires a careful approach to tax policy. Thus, natural gas is central to Uzbekistan's energy sector and plays a key role in ensuring the country's energy security.

Declining production poses serious challenges to the sustainable development of the economy and requires the development of new strategies to optimize the use of this resource. Investments in innovative technologies and infrastructure modernization can be important steps towards improving the situation in Uzbekistan's gas sector. Conclusion. In conclusion, natural gas occupies an important place in the modern energy sector due to its environmental, economic and technological advantages. It is one of the key energy sources providing more than 24% of global energy consumption and its share continues to grow. According to forecasts, this figure could reach 28-30% by 2030, emphasizing the growing importance of gas in the global energy balance.[1]

Analysis of statistical data shows that natural gas not only contributes to a 60% reduction in carbon dioxide emissions compared to coal, but also provides a more efficient use of resources. In particular, the use of natural gas as a fuel for power plants allows for a significant increase in the coefficient

of performance (COP) of electricity generation."[1] In 2023, the share of natural gas in electricity generation was about 40% and is expected to grow further[1] Nevertheless, there are certain challenges associated with the utilization of natural gas.

One of the main ones is the need for an efficient infrastructure for its transportation and distribution. The construction of new gas pipelines and the development of liquefied natural gas (LNG) technologies are becoming key factors to ensure access to this resource in remote regions Natural gas is thus a strategically important resource for achieving sustainable development goals and transitioning to cleaner energy sources. Its use can become a key tool in the fight against climate change if methane leakages are reduced and extraction and transportation processes are optimized. It is important to continue research and implement innovative technologies to maximize the potential of natural gas as a clean energy source.

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Recommendations. In-depth study of environmental benefits: It is recommended to conduct a more detailed study of the environmental aspects of using natural gas compared to other energy sources such as coal and oil. This may include an analysis of emissions of carbon dioxide and other pollutants, as well as an assessment of the impact on public health.

Analysis of international experience: It is necessary to consider successful examples of countries that have effectively integrated natural gas into their energy systems. This can help identify best practices and approaches that can be adapted for Uzbekistan and other countries with similar conditions.

Developing strategies to improve efficiency: It is recommended to develop strategies to improve the efficiency of natural gas production and transportation. This may include the introduction of new technologies such as process automation and the use of modern pipeline condition monitoring systems.

Assessment of economic factors: It is important to conduct an economic analysis that takes into account not only the costs of gas production and transportation, but also the potential benefits from its use in various sectors of the economy. This will help justify the need for investments in gas infrastructure.

Research on alternative energy sources: It is recommended to explore the possibilities of using natural gas in combination with alternative energy sources such as solar and wind energy. This can contribute to the creation of a more sustainable energy system.

Discussion of risks and challenges: It is important to consider in detail the risks associated with the transportation and use of natural gas, including geopolitical risks, technical problems and environmental consequences. This will help to form a more complete picture of the situation in the gas sector.

Attracting investments: It is recommended to develop measures to attract investments in the gas industry, including creating favorable conditions for private investors and foreign companies. This may include tax incentives and simplified licensing procedures.

Educational programs: It is necessary to develop educational programs to raise awareness among the population about the benefits of using natural gas and its role in the sustainable development of the country. These recommendations can help to deepen the understanding of the importance of natural gas in the energy sector and contribute to its more efficient use in the future.

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