



## OVERVIEW OF THE HUNGARIAN ENERGY SECTOR AND POLICY

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### ABSTRACT

Globalization has increased the role of world trade and transport. Oil is the number one source of energy for many industries, especially those based on motor-driven machines. The purpose of this paper is to give insight into the Hungarian energy sector situation and policy. Hungary is a small country with a relatively small amount of domestic energy resources. The Hungarian energy sector has often been determined by external factors and social needs in the past. Among the factors influencing the future of the country's energy sector is the need of society for reliable and secure energy and the country's efforts to overcome the vulnerability caused by energy shortages. Hungary's energy supply is highly dependent on Hungarian power plants, of which the Paks Nuclear Power Plant stands out, which accounts for 49 percent of total production. Like all countries' energy policy, Hungary will be most affected by environmental protection and world market prices. For the future, the primary goal is to secure a supply of national demand and reduce energy dependence.

**Keywords:** Azerbaijan, Hungary, energy sector, oil sector, renewable energy.

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### Introduction

Hungary is a state in Central Europe, which has been an independent parliamentary republic since 1990. It is bordered on the north by Slovakia, on the northeast by Ukraine, on the east and southeast by Romania, on the south by Serbia and Croatia, on the southwest by Slovenia, and on the west by Austria. It covers an area of 93,030 square kilometres and has a population of almost ten million, making it one of the medium-population Member States of the European Union.

Hungary is the 55th largest economy in the world out of 191 countries examined by the IMF [1]. The country is the 37th largest exporter in the world and 36th on the list of importers. Hungary's economy is a high-income OECD economy and one of the most highly developed countries in the world [2]. Hungary is a member of the European Union, NATO, the OECD, the World Bank, and the United Nations, is part of the Schengen area and one of the founders of the Visegrad 4 countries cooperation.

In Hungary, after 1840, coal-based municipal gas plants were installed in several larger cities, primarily to meet the lighting and heating needs of the population. In many respects, municipal gas has become a forerunner and foundation of natural gas supply [3]. In the second half of the 19th century, natural gas had been found when artesian wells were drilled in the Great Hungarian plain. Today, energy and

the supply of heating energy to the population are dominated by oil and natural gas.

Hungarian petroleum production (prospecting, exploration, production) as well as processing and consumption has a past of about 150 years. The first refinery began operation in Fiume (today Rijeka, Croatia). Hungary was the first in the world to declare the state's monopoly of hydrocarbon prospecting and production, in Act VI, 1911 [3].

After the I. world war, the Hungarian government began an intensive search for natural gas and oil. From the 1930s onwards, European Gas and Electric Company (EUROGASCO) carried out its research in Hungary using modern technologies. The EUROGASCO, established by English and American companies, began negotiations with the Hungarian government in 1931. The company wanted to obtain oil and gas concessions and build hydropower and gas-fired power plants in the oil-poor countries of Central Europe. The concession agreement was signed in 1933, according to which the Hungarian state transferred the right to explore for oil and natural gas to EUROGASCO in the territory of Hungary west of the Danube. Their first successful drillings were in 1937 around Budafapuszta, where they found oil and natural gas [5]. November 26, 1937, the start of the Budafapuszta well, is the Hungarian industrial oil industry was born. Then, after initial success, was founded Hungarian-American Petroleum Co. (MAORT) in 1938. EUROGASCO No. 2 in Budafapuszta drilling into a field that for the first time enabled the country to meet its growing oil needs from its own resources. The operation of

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MAORT has been accompanied by special attention since its foundation. Thanks to its invested share capital and vibrant development, it has risen to become one of the country's largest companies in its first years of existence [4]. Until 1941, MAORT operated successfully, after then Hungary joined World War II. because of this the state put it in the service of the military industry. After the Second World War, the Hungarian-Soviet Nyersolaj Rt. (MASZOVOL) was established in 1946. In 1957, the Hungarian oil industry merged into a single organization, the Petroleum Industry Trust was established, to which the gas industry joined in 1960, so its name was changed to the National Petroleum and Gas Industry Trust (OKGT). With the reorganization of the companies controlled by the trust, the corporate system of oil mining, which until 1991 had hardly changed. In 1950, almost 99% of the country's oil production was still in the Transdanubian oil fields, but after that, the focus of exploration and extraction also fell on the Great Plain. The role of oil and natural gas producers in Transdanubia was gradually taken over by the Great Plain [5].

In the second half of the 1950s, the role of hydrocarbons in our energy balance grew so much that it became necessary to develop the manufacturing industry. In 1962, the reconstruction of the Szőnyi refinery began. The Komárom Petroleum Industry Company was established by merging the Szőnyi and Almásfüzítő refineries, to which the Lardoline Oil and Fat Chemical Plant were added in 1965. In 1962, they started to build a new refinery in Százhalombatta. His main task was to process Soviet imported crude oil. The first plant of the Danube Petroleum Company was put into operation in 1965. In the 1970s, another refinery was built. With the completion of the Tisza Petroleum Industry Company, the Hungarian oil refining industry was once again enriched with a modern factory [5].

After several reorganizations, the Hungarian Oil and Gas Company (MOL Rt.) was established as the legal successor of OKGT in 1991, within the organizational framework of which the Hungarian oil industry operates today. During the establishment of MOL, the integration of the entire hydrocarbon industry vertical was successfully completed. Today MOL Group consists, among others, of MOL Hungary, the largest Hungarian company, the Slovakian refiner Slovnaft, the Hungarian petrochemical company MOL Petrochemicals. The company has wholesale and retail operations in almost all countries of the Central East European (CEE) region, including Romania, Serbia, Slovenia, Austria, Czechia, Poland, as well as Italy. MOL is also a major shareholder in INA, the former Croatian national oil company [6], as one of the largest foreign investors in that country.

### **The situation of the energy sector in Hungary**

Hungary's energy sector is characterized by a mix of private and state-owned companies. Magyar Olaj- és Gázipari Nyilvánosan Működő Részvénytársaság (MOL Nyrt.), a former state-owned company privatized in the 1990s and early 2000s, is a key player in the upstream and downstream oil and gas industry. Its subsidiary, FGSZ Zrt. operates the national high-pressure gas transmission system, but sold its gas trading unit to German E.On in 2006. (The state-owned MVM Magyar Villamos Művek Zrt. now owns E.On's gas trading unit.).

Hungarian natural gas trade has been liberalized, but

MVM remains a dominant player with a market share of 60%. The sector has been implementing significant reforms since 2013. As part of these reforms, the government has begun to reduce end-user prices to reduce the cost of living for households. Prices were reduced by 10% in the first year and by 25% in the next two years. Many service providers, such as FŐGÁZ Zrt., E.ON Energiaszolgáltató Kft., GDF SUEZ Energia Magyarország Kft., TIGÁZ Tiszántúli Gázzolgáltató Zrt. suffered operating losses and later returned its authorization to the national authority. As a result, FŐGÁZ Zrt. became the only service provider and now operates under a new company name: NKM Földgázzolgáltató Zrt. [7].

The Hungarian electricity sector is dominated by the state company MVM. MVM controls about 57% of the country's electricity production, directly or indirectly. It also owns 100% of the Paks nuclear power plant, which operates the only nuclear power plant in the country. MVM is also the majority owner of several cogeneration companies and operates backup power plants that provide reliable power supply through its subsidiary [7].

Prices of petroleum products and coal in Hungary are set freely by the market. The Hungarian Energy and Public Utility Regulatory Authority acts as the regulator and sets prices for transportation tariffs, retail, and wholesale sales in the electricity and natural gas sectors. Small consumers have the freedom to choose between the regulated and the open market [7].

35-40 % of Hungary's total primary energy consumption goes domestic heating, hot water and electricity consumption. Based on its EU statistics, Hungary should achieve about the same amount of final cumulative energy savings (4 Mtoe) by 2020, but the relevant policy measures have so far fallen short of the mid-term targets by 20%. In fact, non-refundable EU funds (2014-2020, Environment and Energy Operational Program) are renovating public buildings, resulting in significantly fewer savings than in the case of energy modernization of residential buildings. For the public, there will be a support program for the modernization of household appliances (Warm Homes program).

There are limited fossil fuels in Hungary, so it relies on significant imports. Domestic energy production (from oil, gas, nuclear power, low calorific coal and lignite) meets approximately half of Hungary's energy requirements. The remaining energy need is met from oil imports. Domestic oil production has peaked, so when energy consumption begins to rise, dependency on oil imports will also likely rise [8].

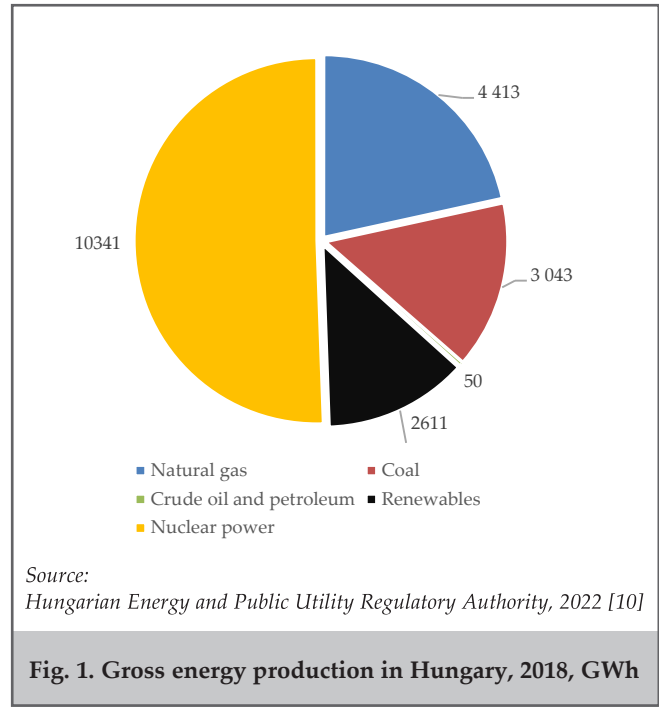
In 2017 gross primary energy production of Hungary equalled 11.04 Mtoe. The country's gross primary energy consumption, however, amounted to 26.7 Mtoe. Hungary's dependence on energy imports fluctuated between 50 and 63 % since the turn of the 21st century. This value equalled 60% in 2017. Hungary is ranked among EU countries with average energy import dependence. Exposure to imports of primary energy sources, however, is extremely high (90% for oil, 80% for natural gas). Hungary imports of natural gas comes from Russia, so the issue of natural gas transmission from Russia is of paramount importance to Hungary.

According to the data in table, imports account for a larger share of Hungary's energy balance. The country's energy production has declined by about 50 petajoules in the last 10 years.

The data in figure 1 also show that nuclear energy

Year	Production	Imports	Exports	Change in stocks (-)	Energy consumption, total
2009	490.3	750.5	127.9	-33.1	1079.3
2010	496.9	789.2	156.4	-9.9	1119.8
2011	493.2	732.5	185.1	55.2	1095.8
2012	492.1	720.8	201.8	30.2	1041.3
2013	480.4	721.4	220.3	25.8	1007.3
2014	464.1	806.1	210.2	-55.0	1005.1
2015	472.9	757.2	189.4	21.5	1062.2
2016	480.2	809.8	212.5	1.0	1078.5
2017	474.9	1011.1	311.7	-48.6	1125.7
2018	462.2	1028.7	379.6	13.6	1124.9
2019	446.5	1204.0	435.5	-107.4	1107.6

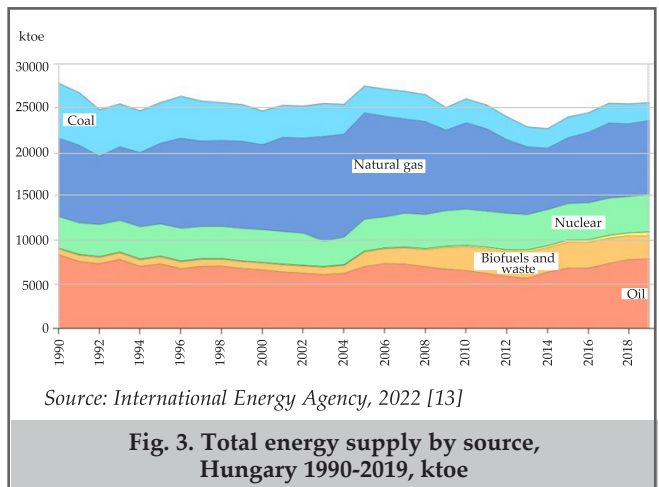
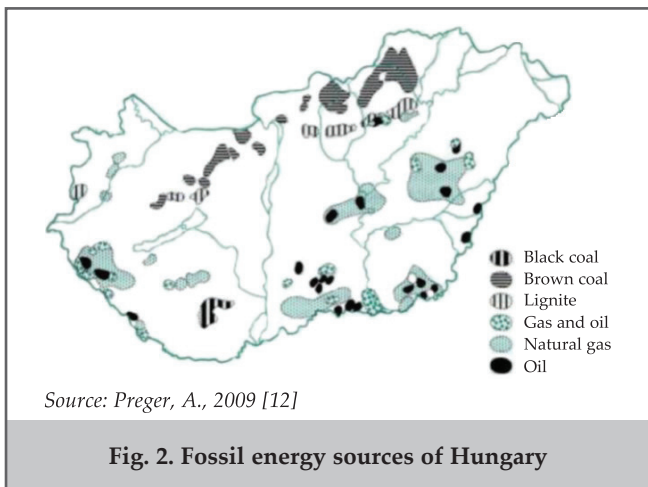
Source: Central Statistical Office of Hungary, 2022. [9]

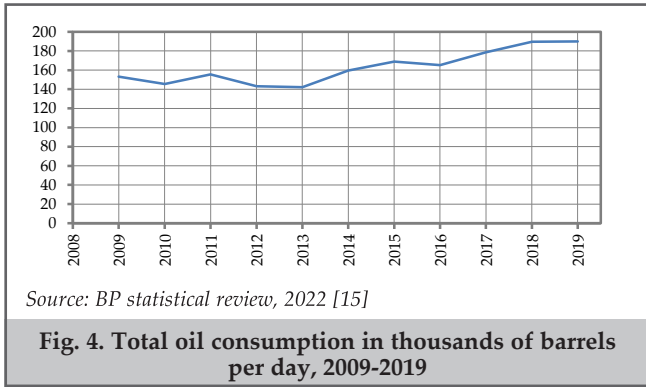


accounts for the largest share of energy production in Hungary, with almost half of all energy, produced coming from the Paks Nuclear Power Plant, which is currently being expanded. The Paks Nuclear Power Plant is the only nuclear power plant in Hungary. Its construction was decided in 1966. On the basis of a 2009 parliamentary resolution and the National Energy Strategy 2030 adopted in 2013, negotiations between Hungary and Russia began on 31 January 2013. As a result of the negotiations, on 14 January 2014, Hungarian Prime Minister Viktor Orbán and Russian President Vladimir Putin agreed on the expansion of the Paks Nuclear Power Plant. The contracts related to the construction, operation, and refuelling of the two new power plant units. The new blocks will be owned by the Hungarian state. The start of the first new block can take place in 2026 at the earliest [11].

Figure 2 shows the occurrence of fossil energy deposits in Hungary.

Hungary has gradually reduced its reliance on coal and natural gas in favor of low-carbon energy sources, but fossil fuels still make up about two-thirds of the energy supply (fig. 3). Energy consumption in the transport sector is growing fast due to the rapid expansion of private motor vehicle ownership.





**Fig. 4. Total oil consumption in thousands of barrels per day, 2009-2019**

originates at Krk Island on Croatia’s Adriatic coast, and could also be used as an alternative supply route for crude oil into a number of regional countries, including Hungary, though at one time Russia was more interested in reversing flow on this pipeline so that it can be used for exporting Russian oil instead. There are also about 1,200 kilometres of oil product pipelines in Hungary; all the crude oil and oil product pipelines are owned by MOL [16].

Natural gas is a key raw material for Hungary’s energy sector. In primary energy production, it ranks first [17].

Like oil production, industrial-scale natural gas production began in 1937, but the amount brought to the surface was not significant until 1960. After that, however, production rose sharply and reached a maximum within a few years, representing 7 Mtoe (7 Gm3). The golden age of Hungarian natural gas production came to an end in 1990, and since then the volume of production has declined rapidly [18].

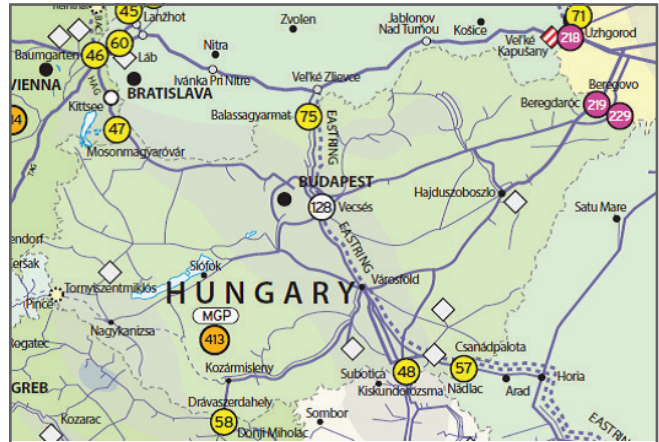
Within the Hungarian primary energy supply mix coal and lignite together represent around 13%, and within the domestic electricity supply it is nearly 20%. The share of coal within the category of «coal and lignite» is less than 10%, and with the ongoing retirement of the coal fired power plants, this share is decreasing further. Lignite fuels the Mátra Power Plant, which, with its 800 MW capacity and high utilization, is the second largest producer of electricity in Hungary. Most of the lignite is mined near the Mátra Power Plant in North-Eastern Hungary. Out of the ca. 4300 million ton lignite reserve of Hungary, 500 million ton is available in the Western part of the country, at Torony village [12].

Until the 1990s, coal production was a dominant segment of heavy industry in Hungary, with production approaching 30 Mt. From 1990s production declined radically and the liquidation affected both black coal and lignite production. The production of the two types of coal was completely eliminated in the former case, and in the latter case, it was decisively eliminated by the liquidation of the deep mining mines. According to the BP Annual Statistical Review, Hungarian domestic production fell by 30% in ten years from 2.9 Mtoe to 1.9 Mtoe [18].

Figure 6 shows the dependence of each country on coal, based on the figure it can be said that Hungary has a moderately strong dependence on the coal energy sources.

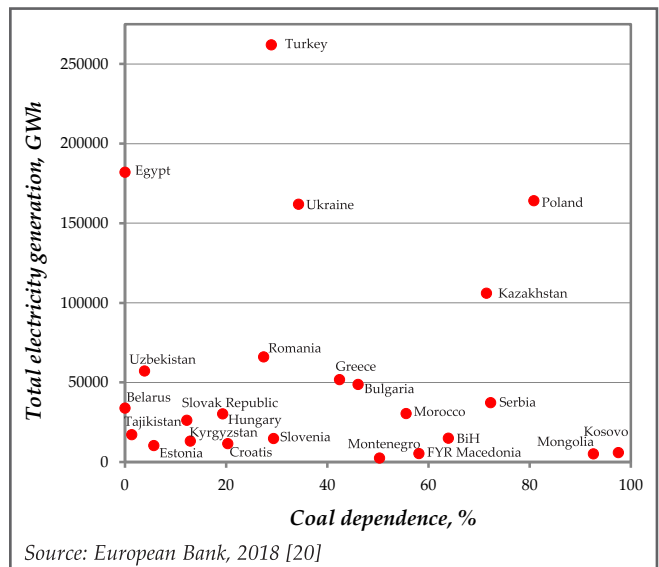
**Brief introduction of the energy policy of Hungary**

The most important strategic goal of the Hungarian energy policy is to optimize the coexistence of security of supply, competitiveness and sustainability as primary goals, also considering long-term aspects.



Source: <https://www.entsog.eu> [19]

**Fig. 5. Transmitting and receiving points in Hungary**



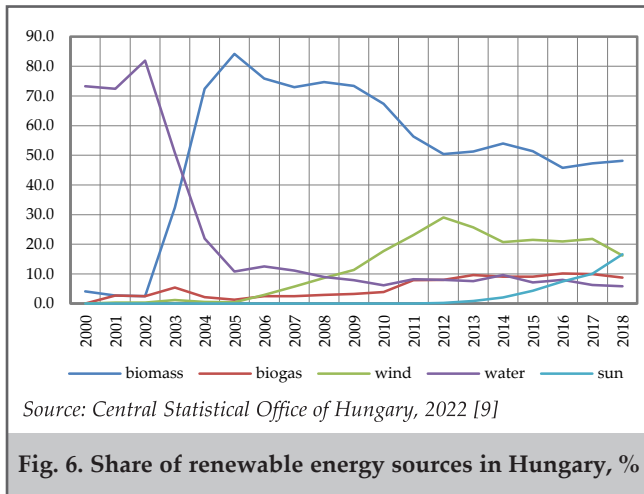
Source: European Bank, 2018 [20]

**Fig. 6. Coal dependence, 2017**

Security of energy supply is one of the main goals of energy policy, for which Hungary has identified the following areas:

1. development of the structure of the energy source,
2. diversification of energy imports,
3. strategic energy stocks,
4. infrastructural developments,
5. social responsibility.

The aim is to create an energy source structure in which the share of domestic resources is maintained and the composition of imports becomes more balanced, and it originates from several safe sources and directions. In order to improve the continuity and security of energy supply, in addition to the use of domestic resources, it is necessary to increase the security of imports and accumulate security stocks [21]. However, domestic energy sources cover only 30% of the total demand, so it is also necessary to procure foreign sources. While MOL’s acquisition of 9.57% in the ACG oil field in Azerbaijan and 8.9% in the BTC pipeline are not directly serving Hungary’s energy security goals, the fact that ACG crude has been successfully refined in MOL Group’s Croatian refinery at Rijeka has had an indirect



**Fig. 6. Share of renewable energy sources in Hungary, %**

positive impact on the security of crude supply for the Central and South East European region.

The ACG deal, which is worth \$ 1.57 billion, allowed MOL to enter the ownership structure of the largest oil field in Azerbaijan as the third-largest shareholder after BP and SOCAR. Oil has been extracted in the area since 1997, which means that the production equipment has been operating reliably for more than 20 years. The country's largest oil field is operated by BP, one of the leading oil companies, and in 2018, an average of 584,000 barrels was produced in the area. MOL Group works with leading oil companies such as BP, Exxon, Equinor and SOCAR with its stake in this key strategic asset. MOL has also acquired a stake in the BTC pipeline, which transports crude oil from Azerbaijan to one of Turkey's Mediterranean ports, Ceyhan and thus to world markets. The BTC pipeline is 1,768 kilometres long, making it the second-longest pipeline in the former USSR after the Friendship pipeline [22].

Azerbaijan has a key role to play in making Hungary's energy supply more secure. In addition to crude oil, gas can also come from Azerbaijan to Central Europe, and from 2023 Hungary will be able to buy 1-2 billion cubic meters of gas a year from Azerbaijan [23] through the Southern Gas Corridor [24].

Due to the growing global and regional responsibility under international law and the growing ecological awareness of national decision-makers, energy policy must put countries on a path of development that cause less greenhouse gas emissions [25]. The European Union has an ambitious plan to achieve 80-95 % reduction of greenhouse gas emissions by 2050 compared to the 1990 level [26].

The Hungarian Constitution emphasizes its commitment to the promotion and protection of its heritage, including all the artificial and natural values of the Carpathian Basin: «we take responsibility for our descendants; therefore, by using our material, intellectual and natural resources prudently, we will protect the living conditions of future generations» (Preamble of the Hungarian Constitution, Recital 8).

In February 2008, the National Climate Change Strategy for 2008–2025 was adopted by the Hungarian Parliament. The strategy emphasizes the need for increased energy efficiency, energy savings, and the use of renewable energies (wind, solar, geothermic, and biomass). It does not mention nuclear energy as part of the concept.

The National Energy Strategy was adopted by Parliament in October 2011. The National Energy Strategy gives a roadmap until 2030. The main aim of the strategy is to ensure the optimal balance of security of supply, competitiveness, and sustainability. Energy imports should be decreased by the diversification of resources and/or origins. The main elements of the strategy include the increased use of renewables, maintenance of nuclear capacity (lifetime extension and consideration of building new capacity), development of regional energy infrastructure, development of a new organizational system as well as increased effectiveness and efficiency in energy use.

Like the energy policy of all nations, the Hungarian one will be determined in the future by the fight against climate change. In the field of climate change, the main objectives of the National Climate Change Program are:

- decreasing the emission of greenhouse gases,
- enhancing energy efficiency and economical use of energy,
- enhancing sinks through increasing the territory of larger free soil surfaces and vegetation,
- enhancing resilience against the ecological, social and economic effects, prevention and mitigation of damages, enhanced level of energy efficiency rate of the buildings and household electronic tools (Climate Change Strategy of Hungary) [27].

The principle of sustainability includes the development and use of competitive renewable energy sources, improving energy efficiency, and mitigating the causes of climate change. The use of renewable energy sources also helps to meet Hungary's environmental and nature protection objectives and contributes to increasing the security of supply through the use of domestic resources.

Hungary has one of the best geothermal resources in the EU. Conditions for solar energy are also favourable in Hungary, with its expansion currently expanding rapidly. The overall wind energy potential is not significant, although certain regions have a reasonable amount of wind potential. The rate of hydropower utilisation has remained at a low but stable level in the last decades.

The figure 7 shows the share of each renewable energy source in Hungary's total energy production. In 2018, renewable energy sources accounted for only 8.1 percent of the country's energy production. The most significant renewable energy source is biomass, which still accounts for almost half (48.1%) of domestic renewable energy sources, followed by solar energy (16.6%) and wind energy (16.2%). Currently, hydro energy accounts for the smallest share of all renewable energy, at 5.9 percent.

## Conclusion

It is to be expected that energy demand in international markets will continue to grow, there will be global competition for energy resources, which will raise security issues, that the supply of crude oil and natural gas will become more difficult, and that the risk of shortages will increase.

Further tightening of environmental and nature protection and climate policy requirements will affect the operational framework for energy. In the next years, protecting the environment and reducing the pollution will become an unavoidable compulsion for the nations. Energy decisions must be made in the knowledge that environmental and nature protection and climate policy regulations will be tightened. Energy supply and consumption have significant environmental impacts, the mitigation of which is a key issue in energy policy. Compliance with environmental protection and climate policy regulations, limit values, and legislation is an external requirement of energy policy, but it also offers opportunities for the spread of energy industry innovations.

It is in Hungary's interest to achieve the goals of social utility and efficiency at the lowest cost, keeping in mind the requirements of continuous and secure energy supply, environmental protection requirements, the utilization of renewable energy sources, and the improvement of energy efficiency.

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### Реферат

Глобализация повысила роль мировой торговли и транспорта. Нефть является основным источником энергии для многих отраслей промышленности, особенно для тех, которые основаны на использовании машин с механическим приводом. Цель данной статьи – дать представление о ситуации и политике в энергетическом секторе Венгрии. Венгрия – небольшая страна с относительно небольшим количеством внутренних энергетических ресурсов. В прошлом энергетический сектор Венгрии часто определялся внешними факторами и общественными потребностями. Среди факторов, влияющих на будущее энергетического сектора страны, – потребность общества в надежной и безопасной энергии и усилия страны по преодолению уязвимости, вызванной нехваткой энергии. Энергоснабжение Венгрии в значительной степени зависит от венгерских электростанций, среди которых выделяется атомная электростанция «Пакш», на долю которой приходится 49% общего производства. Как и энергетическая политика всех стран, энергетическая политика Венгрии будет в наибольшей степени зависеть от охраны окружающей среды и цен на мировом рынке. На перспективу основной задачей является обеспечение национального спроса и снижение энергетической зависимости.

**Ключевые слова:** Азербайджан; Венгрия; энергетический сектор; нефтяной сектор; возобновляемая энергетика.

## Macarıstanın energetika sektoru və siyasətinin icmalı

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### Xülasə

Qloballaşma dünya ticarətinin və nəqliyyatının rolunu artırdı. Neft bir çox sənaye sahələri üçün, xüsusən də mexaniki intiqallı maşınların istifadəsinə əsaslanan sahələr üçün əsas enerji mənbəyidir. Bu məqalənin məqsədi - Macarıstanın energetika sektorunun vəziyyətinin və siyasətinin təsvirini verməkdir. Macarıstan nisbətən az daxili enerji ehtiyatına sahib olan kiçik bir ölkədir. Keçmişdə Macarıstanın energetika sektoru tez-tez xarici amillər və ictimai ehtiyaclarla müəyyən edilirdi. Ölkənin energetika sektorunun gələcəyinə təsir edən amillər sırasında - cəmiyyətin etibarlı və təhlükəsiz enerjiyə ehtiyacı və ölkənin enerji çatışmazlığından yaranan zəifliyi aradan qaldırmaq cəhdləridir. Macarıstanın enerji təchizatı böyük ölçüdə Macarıstan elektrik stansiyalarından asılıdır, onlardan, ümumi istehsalın 49%-ni təşkil edən "Paks" nüvə elektrik stansiyası seçilir. Bütün ölkələrin energetika siyasəti kimi, Macarıstanın energetika siyasəti də ən çox ətraf mühitin mühafizəsindən və dünya bazarındaki qiymətlərdən asılı olacaq. Gələcəkdə əsas vəzifə milli tələbatın təmin edilməsi və energetika asılılığının azaldılmasıdır.

**Açar sözlər:** Azərbaycan; Macarıstan; energetika sektoru; neft sektoru; bərpa olunan energetika.