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RELATIONSHIP BETWEEN USE OF RENEWABLE ENERGY SOURCES AND ECONOMIC EFFICIENCY

Abstract

The world's energy production is mainly provided by thermal power plants, hydroelectric power plants and nuclear power plants. The rapid consumption of fossil fuels and the release of greenhouse gases into the atmosphere cause global warming, and therefore not only an energy crisis; This also creates an environmental crisis. For this reason, transition to the use of renewable energy has become mandatory in recent years.

The article examines the relationship between the use of renewable energy sources and economic efficiency. Also, to determine the impact of the use of renewable energy on economic efficiency in Kazakhstan. A statistical comparability study between 2015-2023 is included. It was found that there is a unidirectional causal relationship between the use of renewable energy and economic efficiency. The most important initiative to increase the impact of the use of renewable energy is to shift the energy policy to the domestic and renewable energy sector with new technologies. Kazakhstan is an initiator of the potential of renewable energy resources. For this reason, renewable energy production should be used in the most effective way in the sustainable development of Kazakhstan.

Key words: renewable energy sources, energy efficiency, economic efficiency.

Introduction.

Renewable energy sources have become an integral part of the global energy sector. In addition, with the rapid development of the world economy, the demand for renewable energy sources is continuously growing.

In modern, dynamically changing society, more and more people are interested in renewable energy sources. This interest is fully justified, because recently energy and environmental problems have become more and more obvious. When the leaders of states and international organizations discuss the problems that have arisen, they come to the conclusion that in the future these problems can be solved only by using environmentally friendly renewable energy sources [1].

According to Article 1-4: According to the Law on support for the use of renewable energy sources, "renewable energy sources are continuously renewable energy sources due to natural processes, which include the following types: solar energy, wind energy, hydrodynamic water energy; geothermal energy: heat of soil, underground water, rivers, water bodies; as well as anthropogenic sources of primary energy resources: consumer waste, biomass, biogas and other fuel obtained from consumer waste used for the production of electricity and (or) thermal energy [2]. According to Article 3, the state regulation in the field of supporting the use of renewable energy sources is to create favorable conditions for the production of electricity using renewable energy sources in order to reduce the energy demand of the economy and the impact of the electricity and heat energy production sector on the environment and to increase the share of the use of renewable energy sources in the production of electricity is carried out for the purpose [2].

In January 2016, 193 member countries of the United Nations implemented 17 goals within the framework of sustainable development. These goals include affordable and clean energy, decent work and economic growth. In all developing countries, expanding infrastructure and upgrading technology to provide clean energy is an important environmental and growth-promoting goal. On the other hand, the goal of economic growth includes sustainable economic growth, full and

productive employment, and the maintenance of decent jobs for all. To ensure sustainable development, it is considered one of the most basic inputs of development, which need to meet the ever-increasing energy needs due to economic growth and population growth to carry out production-oriented or economic activities and improve living standards. In general, the need for energy in the world is increasing day by day, on the one hand, there is a limited amount of energy resources that are constantly increasing in the direction of decrease, and wider groups should understand, and countries should revise their energy policies and tend to use energy more efficiently [3].

In the 2000s, the search for alternative energy gradually accelerated and research in the field of renewable energy began to increase. The most important feature that distinguishes renewable energy from other forms of energy is that it does not disappear and can renew itself naturally. In addition, since renewable energy sources are domestic resources, they do not need to be imported, thus reducing external dependence on energy and reducing carbon emissions and environmental damage are becoming increasingly important [4].

Renewable energy is gaining importance and economic efficiency day by day due to the environmental impact of energy resources and issues of security of supply. Even mineral-rich countries aim to maintain their current economic status by investing in renewable energy sources. Basically, these investments also affect the economic growth indicators of the countries.

In developing countries, expanding infrastructure and upgrading technology to provide clean energy is an important goal that can stimulate growth and contribute to the environment [5].

Main part.

The share of renewable energy sources (RES) in total electricity production in Kazakhstan reached 6.5%. In addition, the widespread use of fossil-based energy resources such as oil, coal and natural gas requires increasing the efficiency of renewable energy use and ensuring its distribution.

From a geographical and meteorological point of view, Kazakhstan is a country suitable for large-scale use of wind energy. Implementation of the policy of development of renewable energy sources in the economy of Kazakhstan begins in 2009. This year, the first legislative initiatives to support renewable energy sources took place in the country.

In 2013-2015, the concept of transition to a green economy and fixed tariffs for renewable energy sources were used. In addition, tasks for the development of renewable energy sources were set in the overall energy balance of the country, ways to support ecological integrity and adapt to a changing global climate were compared. It should be noted that the share of solar and wind energy in 2015 was only 0.2 percent.

In 2018, auctions for renewable energy sources began to be launched. An auction trading mechanism was introduced for the competitive selection of projects of renewable energy sources and changes were made to the existing legislation in the sector of its use. According to the data, the share of fossil fuels in Kazakhstan in 2018 was 81.3%, hydropower 9.7%, gas turbines 8.5%, solar, wind and bioenergy 0.5%.

Estimated balance of electricity of the Unified Electric Power System of Kazakhstan until 2035 by setting goals and objectives for achieving carbon neutrality in 2022-2023; end of renewable energy support law (exemption from property tax and land tax, as well as exemption from corporate income tax); Kazakhstan has joined the global movement to achieve carbon neutrality.

However, the strategy of achieving carbon neutrality of the Republic of Kazakhstan until 2060 and the new environmental code of the Republic of Kazakhstan will be put forward.

Renewable energy sources (RES) are energy resources of natural processes that are constantly occurring on the planet, as well as energy resources of plant and animal bioresources [6]. A characteristic feature of renewable energy sources is the cyclic nature of their renewal, which allows the use of these resources without a time limit.

Currently, if we look at the fuel-energy balance of the Republic of Kazakhstan, the final energy consumption by fuel types is as shown in Figure 1.

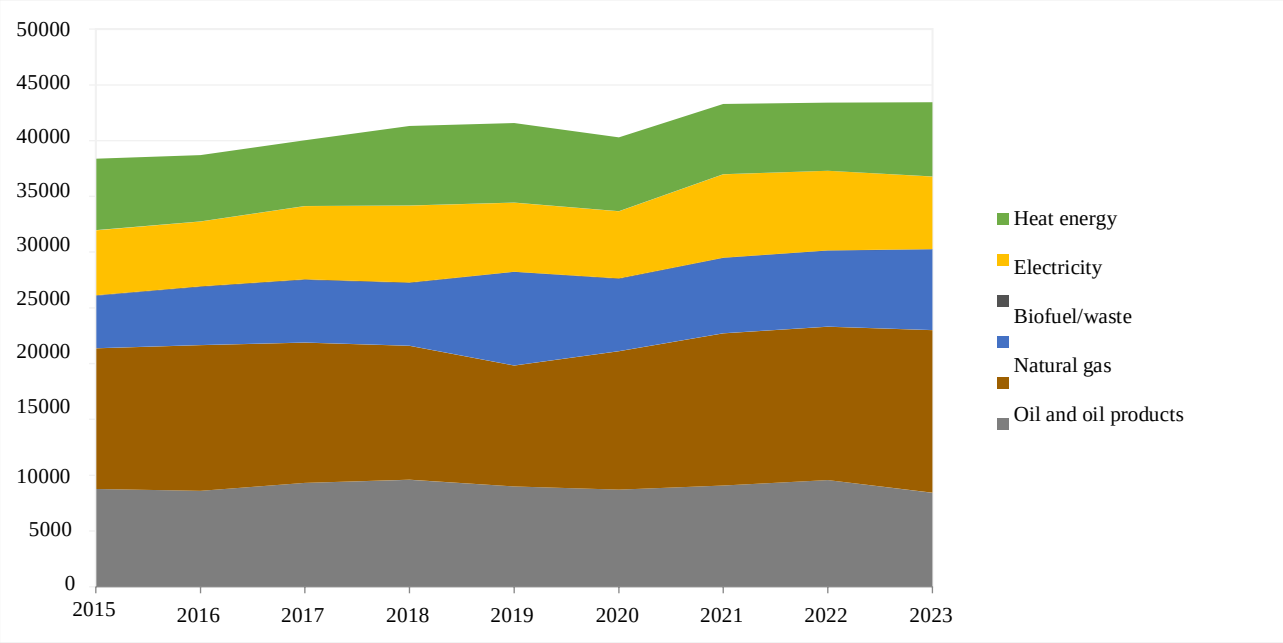


Figure 1. Final consumption of energy by types of fuel

In 2023, the largest share of final energy consumption will be oil and oil products - 33.5% and coal - 19.4%. The share of electricity consumption from the final consumption of total energy was 15%, natural gas - 16.7% and heat energy - 15.3% [7].

Regarding the final consumption of energy by economic sectors. As shown in Figure 2 below, the manufacturing sectors decreased from 42.2% in 2015 to 15.8% in 2023, commercial and commercial services decreased by 8.9% from 2015 to 2023, similarly, the residential sector (population) increased by 7.8%. And in the transport sector, if it increased from 2015 to 2018, it decreased until 2021, and again increased to 16% in 2022, then decreased to 10.1% in 2023. During the eight years of energy consumption by general economic sectors, there were various deviations.

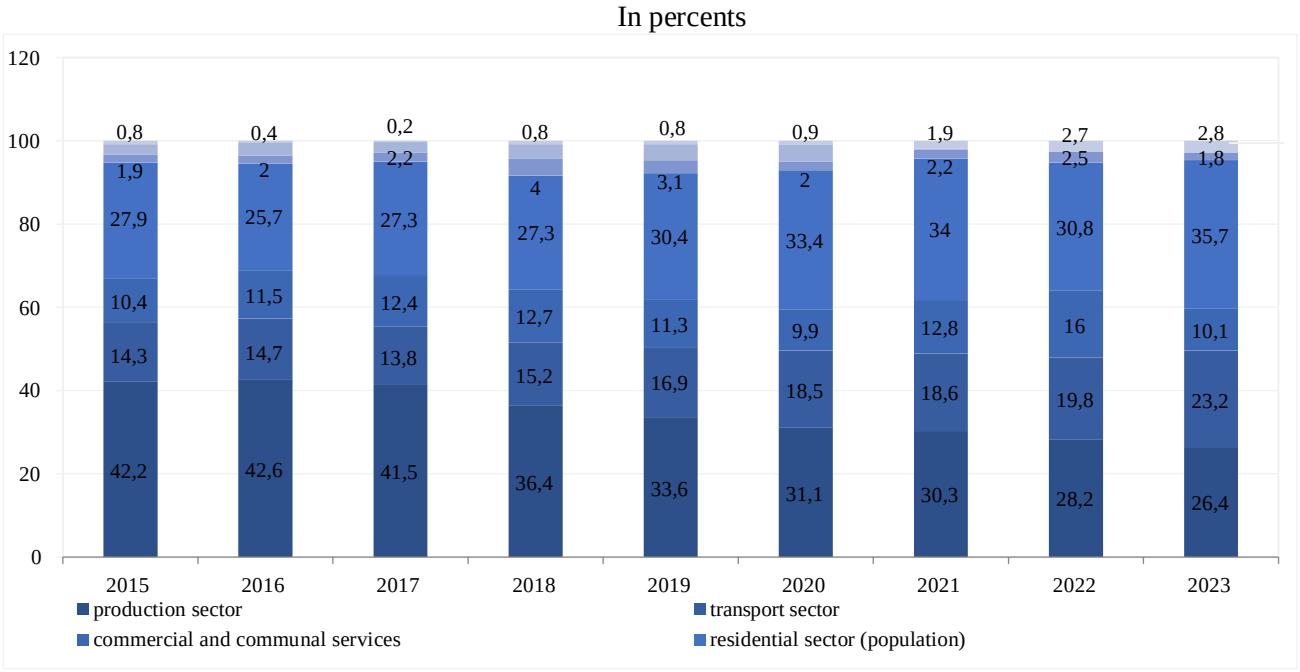


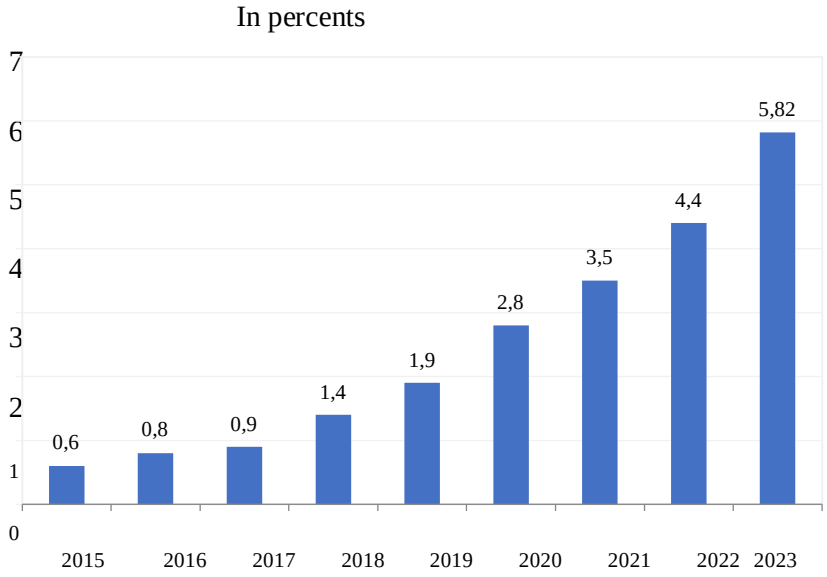
Figure 2. Final energy consumption by economic sectors

In the final consumption of energy, the share of the industrial sector, commercial and communal services is decreasing, and the share of the transport sector and the housing sector is increasing. In the structure of final consumption in 2023, the housing sector had the largest share - 35.7%, and its consumption amounted to 13.9 million tm. The industrial sector is the second largest consumer of energy (after the residential sector) and the industrial sector's consumption amounted to 11.4 million tm. The transport sector is the third largest consumer in total final consumption (after the residential sector and the industrial sector) and the volume of final consumption of the transport sector will be 10.1 million tm in 2023 [7].

Renewable energy sources can contribute to socio-economic development. Moreover, fossil fuel producers remain a powerful lobby that favors the development of conventional energy. The Government of Kazakhstan is solving all these problems by simplifying project approval procedures and attracting private investments, including foreign investors, to the sector.

In the total volume of electricity production, there is a constant increase in the share of electricity produced by renewable energy sources without taking into account large hydroelectric power plants (Figure 1), and in 2023 this figure was 5.82% [4]. That is, compared to 2015, it has grown to 5.22 percent.

In general, the state has been making a positive contribution to economic growth since the introduction of renewable energy sources. The development of renewable energy sources reduces dependence on traditional fuels for import-dependent countries and reduces risks related to price volatility. This is especially important for low-income countries. Therefore, this commentary aims to analyze the economic impact of renewable energy development [8].



**excluding large hydroelectric plants.*

Figure 3. Share of electricity produced by renewable energy sources

Since renewable energy sources are distributed in different regions of the country, there is an opportunity to use them in industrially underdeveloped, economically and socially poorly developed geographical areas. Increasing economic experience is encouraged by the use of renewable energy sources, for example, the cultivation of bioenergy crops in remote areas with a developed agricultural sector (energy agriculture) and the use of these energy resources where they are abundant. Energy sources, solar or wind energy, as well as the level of development in previously undeveloped areas, have continued to grow, so it can become popular and develop. Therefore, renewable energy effectively closes the development gap between regions and reduces economic and social imbalances.

It is an important issue to provide social support for widespread use and economic efficiency

of renewable energy. First of all, people need to understand the nature of energy produced from these sources and believe in its benefits, in short, create public awareness and sensitivity to support renewable resources. Then, an increase in the capacity of goods and services produced indicates economic growth. Continuous growth of GDP in a country means economic growth. To determine the growth of economic growth in the country, it is carried out by calculating the average growth rate and the annual growth rate. The average growth rate measures real GDP growth over a period of time. In addition, the importance that political authorities place on productivity-enhancing skills and infrastructure investments that increase technology and physical capital is also affected.

Renewable energy sources are one of the vectors of development of energy complex of Kazakhstan in recent years. In general, in recent years, taking into account the global experience, important steps have been taken to improve the investment climate in the renewable energy sector, for example, the investment amount is about 50 billion KZ tenge. Among them, wind power stations - 9 billion KZ tenge, solar power stations - 13 billion KZ tenge, hydroelectric power stations - 28 billion KZ tenge. And in 2024, commissioning of 11 facilities for the use of renewable energy sources with a capacity of 117.35 MW, including: 3 wind power plants with a capacity of 27.45 MW; 2 solar power plant with a capacity of 40 MW; 6 hydroelectric power stations with a capacity of 49.9 MW, as well as through the active implementation of the state policy aimed at taking systematic measures for the development of renewable energy sources [9].

Conclusion

In conclusion, Kazakhstan needs to invest more in renewable energy sources and work to develop renewable energy sources. Kazakhstan faces high inflation, rising unemployment, high dependence on foreign energy and foreign trade problems. Energy is one of the most fundamental factors of social and economic development and is undertaking a structural transformation in the economy to achieve the ultimate goals in energy. To solve these problems, it is necessary to introduce technological progress in all aspects of production, to move to a production-based economy, and to maximize the potential of a skilled workforce.

The most important element that can ensure sustainable development is environmental sustainability. Although energy is an important development concept, it is the largest input of production. Therefore, it is important to increase the use of environmentally friendly renewable energy in ensuring development. In fact, by using renewable energy, environmental pollution is reduced and energy is used more efficiently.

Kazakhstan's dependence on external energy sources and the fact that imported energy is mainly based on fossil fuels also leads to the problem of carbon dioxide emissions. Encouraging investments in renewable energy sources and increasing their use is of great importance in reducing harmful emissions. Although the initial set-up costs of investing in renewable energy sources are seen as a high price, if technological development and progress is achieved, the cost difference between renewable energy and fossil fuels can be reduced.

Since 2009, the policy of promotion of renewable energy sources in Kazakhstan is defined in accordance with the law approved by the legislation of the Republic of Kazakhstan. The most important of these incentives is the fixed price guarantee. In the fixed price guarantee, the state aims to support the use of renewable energy under the conditions established by legislation, by setting separate prices for each production, if they are not equal. Renewable energy investments in Turkey can include projects such as using domestic raw materials and materials in power plants, reducing costs through state support during the construction phase of the power plant, and encouraging the use of electric vehicles.

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ЖАҢАРТЫЛАТЫН ЭНЕРГИЯНЫ ПАЙДАЛАНУ МЕН ЭКОНОМИКАЛЫҚ ТИІМДІЛІК АРАСЫНДАҒЫ БАЙЛАНЫС

Түйін

Дүние жүзіндегі энергия өндірісін негізінен жылу электр станциялары, су және атом электр станциялары қамтамасыз етеді. Қазба отындарының жылдам тұтынылуы және парниктік газдардың атмосфераға бөлінуі жаһандық жылынуды тудырады, демек энергетикалық дағдарысты ғана емес; Бұл да экологиялық дағдарысты тудырады. Осы себепті соңғы жылдары жаңартылатын энергияны пайдалануға көшу міндетті болып отыр. Мақалада жаңартылатын энергияны көздерін пайдалану мен экономикалық тиімділік арасындағы байланысы қарастырады. Сондай-ақ, жаңартылатын энергияны пайдаланудың Қазақстандағы экономикалық тиімілігі бойынша әсерін анықтау. 2015-2023 жылдар арасындағы статистикалық салыстырмалықты зерттеуді қамтиды. Жаңартылатын энергияны пайдалану мен экономикалық тиімділік арасында бір жақты себепті байланыс бар екені анықталды. Экономикалық тиімділік жаңартылатын энергияны пайдаланудың әсерін арттырудың ең маңызды бастамасы энергетикалық саясатты жаңа технологиялармен ішкі және жаңартылатын энергия секторына ауыстыру болып табылады. Қазақстан жаңартылатын энергия ресурстарының әлеуетін бастамашы ел. Осы себепті Қазақстанның тұрақты дамуында жаңартылатын энергия өндірісі ең тиімді түрде пайдаланылуы керек.

Кілттік сөздер: жаңартылатын энергия көздері, энергия тиімділігі, экономикалық тиімділік.

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ВЗАИМОСВЯЗЬ МЕЖДУ ИСПОЛЬЗОВАНИЕМ ВОЗОБНОВЛЯЕМЫХ ИСТОЧНИКОВ ЭНЕРГИИ И ЭКОНОМИЧЕСКОЙ ЭФФЕКТИВНОСТЬЮ

Аннотация

Производство энергии во всем мире в основном обеспечивается тепловыми электростанциями, водными и атомными электростанциями. Быстрое потребление ископаемого топлива и выброс парниковых газов в атмосферу вызывают глобальное потепление и, следовательно, это вызывает не только энергетический кризис; но и экологический кризис. По этой причине в последние годы

переход на использование возобновляемых источников энергии становится обязательным. В статье рассматривается взаимосвязь между использованием возобновляемых источников энергии и экономической эффективностью. Также определяется влияние использования возобновляемых источников энергии на экономическую эффективность в Казахстане. Включает исследование относительных статистических величин между 2015 и 2023 годами. Было обнаружено, что существует односторонняя причинно-следственная связь между использованием возобновляемых источников энергии и экономической эффективностью. В целях экономической эффективности наиболее важной инициативой по увеличению эффекта от использования возобновляемых источников энергии является перевод энергетической политики в сектор внутренней и возобновляемой энергии с новыми технологиями. Казахстан – страна, проявляющая инициативу в развитии потенциала возобновляемых энергоресурсов. По этой причине в устойчивом развитии Казахстана производство возобновляемой энергии должно использоваться наиболее эффективно.

Ключевые слова: возобновляемые источники энергии, энергоэффективность, экономическая эффективность.

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