



Analysis of Alternative Energy Efficiency in the Economy of Uzbekistan

Kodirov Bahodir Tursunovich

Assistant of the Chair of Socio-Economic Sciences, Andijan institute of economics and construction

ABSTRACT

This article discusses the importance of the production of renewable alternative energy resources in our society. It is reported that Uzbekistan has unlimited opportunities for the production of solar and wind electricity, the needs for foreign and domestic investment in its production, and therefore the construction of RER (Renewable energy sources) production stations in the regions. In this regard, hydrogen, which is an environmentally friendly fuel, is also important. At a time when 50-60% of the energy produced in the energy system in developed countries is due to renewable energy sources, the fact that this figure is less than 5% in Uzbekistan means that this issue is extremely relevant.

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Introduction. Reducing the consumption of energy resources in our national economy, the widespread introduction of energy-saving technologies for production, expanding the use of renewable energy sources is an urgent issue. Energy efficiency serves the rational use of energy resources in economic sectors, increasing labor productivity and improving the welfare of the population.

Our national economy is one of the most developed countries in the world in terms of energy and carbon capacity. The energy consumption per unit of GDP in the world is 0.170 kg.i.e. in 2000-2020. and 0.149 kg.i.e. Although this figure has decreased to 0.689 kg.i.e. in Uzbekistan during the period

2000-2020. and 0.150 kg.i.e. shortened to. The energy intensity of Uzbekistan's GDP remains above the world average.

The main part. In 2010-2021, the existing electricity generation capacity of Uzbekistan amounted to 12.9 GW, of which thermal power plants (TPPs) - 11 thousand MW or 84.7%, hydropower plants (HPPs) - 1.85 thousand MW or 14.3%, block stations and insulated stations - 133 MW more than or 1.0% was produced. In 2020, 88.9% of electricity generated in Uzbekistan will be generated by thermal power plants. Hydropower is 42 kg.i.e., with a total capacity of 1.68 GW and a capacity of 28 kg.i.e. along the water flow. and 2 micro HPPs of 0.5 MW.

The capacity of modern energy-saving power units is 2825 MW or 25% of the total capacity of IES. In 2020, 88.9% of electricity generated in Uzbekistan was generated by thermal power plants. The reservoirs have 10 HPPs with a total capacity of 1.4 GW. The utilization rate of the country's hydro potential is 28%. (See Table 1)

Table 1. Forecast of alternative energy generation capacity in Uzbekistan for 2021-2030 MW / h.

Years	22021	22022	22023	22024	22025	22026	22027	22028	22029	22030
Hydroelectric power plants	0,2	0,4	1,2	1,6	2	2,2	2,4	2,6	2,8	3
Wind power plants	2,3	2,3	1,3	2,4	3	3,4	3,8	4,2	4,6	5
Solar power plants	-	1	2,4	2,6	2,8	3	3,2	3,5	3,7	3,8

Source: <https://revicw.uz/ru/post/vozobuovlyacmaya-energiya-dlya-ustoychivogo-razvitiya>

However. Power grids have been in operation since 1990, accounting for 66% of the main facilities, 73% of substations and 50% of transformer substations. This leads to a loss of up to 20% in the supply of electricity to the provinces. In the period 2000-2020, the production of electricity in the country increased by an average of 2.8% per year, but does not fully meet the demand for electricity, ie 10% of demand is not met.

It is projected that in the period from 2025 to 2030, the average annual growth of demand for electricity in Uzbekistan will be 6-8%. By 2030, the country's electricity consumption is expected to increase by 3% compared to 2020, the demand for electricity in the economy will double, and the per capita electricity consumption will increase to 72%. Per capita electricity consumption in Uzbekistan in 2020 was 9,700 kWh in South Korea, 4,292 kWh in China, 6,288 kWh in Russia, 5,130 kWh in Kazakhstan and 2,620 kWh in Turkey.

Uzbekistan has huge reserves of alternative (renewable) energy resources. These sources include solar, wind, hydropower and hydrogen energy. However, one of the reasons hindering the development of this sector is due to changes in weather conditions and the day-to-day exchange of alternative energy sources. Wind power generators operate only when the wind speed is higher than 5-6 m / s and provide energy for an average of 3300-4300 KW per year (annual duration 8760 KW). Solar photovoltaic plants operate only during daylight hours, when it is cloudless and partly cloudy. In the regions of Uzbekistan with high solar potential, it provides an average of 1600-2400 kWh.

Despite the huge potential of solar and wind energy, industrial solar and wind power plants are being built in Uzbekistan, and government decrees and orders are being issued. It is planned to build 3GW wind and 5GW solar power plants of alternative energy resources in 2020-2030. (See Table 2)

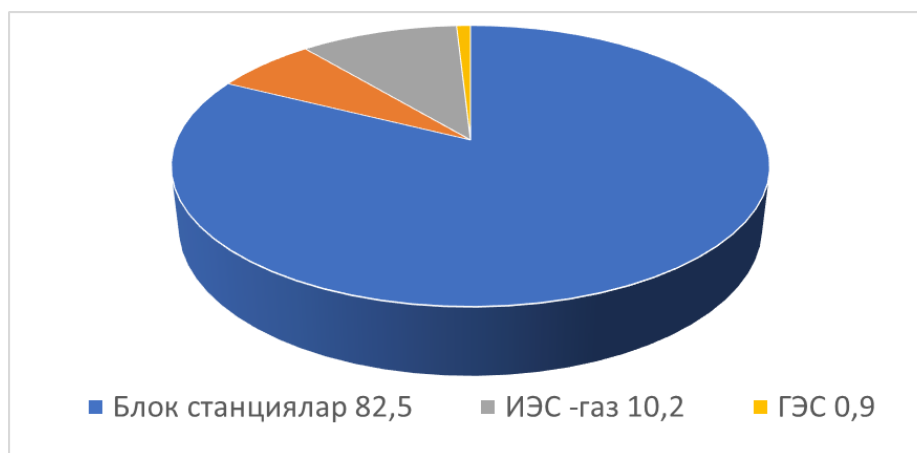
Table 2. Potential of alternative energy sources in Uzbekistan.

Types	Total potential	Technical potential
Hydro energy	9,2 mln t.i.e	2 mln t.i.e
Wind energy	2,2 mln t.i.e	0,4 mln t.i.e
Sun energy	50 973 МЛН Т.И.Э	177 mln t.i.e
Geothermal energy	67 000 mln t.i.e	0,3 mln t.i.e
Total	117 984 mln t.i.e	179,3 mln t.i.e

Source: <http://minenergy.uz/uz/lists/view/32>

In 2020, 69.72 billion soums will be spent in our country. KWh of electricity was generated, 88.7% of which came from gas and coal-fired thermal power plants. By 2030, on the basis of modernization of electricity generation, it is planned to increase the share of electricity generation from alternative (alternative) sources to 15.3%, the share of nuclear energy to 14.9%, and reduce the share of gas and coal to 58.5%. (see Figure a)

a-picture.



In% of the volume of future electricity generation in Uzbekistan. 63.6 billion kWh by 2020.

Source: <http://minenergy.uz/uz/lists/view/32>

In order to attract foreign direct investment in renewable energy in Uzbekistan in 2020-2022, in cooperation with international institutions, using the Build-own-operate model, investors were identified and long-term (2020-2045) contracts were concluded. In addition, medium-capacity (1-2 MW / h) solar power plants are being built (in Kashkadarya, Surkhandarya, Bukhara, Jizzakh, Syrdarya, Fergana, Andijan and Namangan regions). Electricity generation for consumers' own needs In 2021-2025, 150,000 solar photovoltaic power plants (2-3 MW / h) and water heaters (average 200-250 liters of water) are being installed at 2-2.5% for households. By 2026, alternative energy stations (including households) in settlements (mahallas) will increase by 4.3% to 800-900 million kWh per year. It is planned to provide electricity in kW / h. (See Figure b).

In% of the volume of future electricity generation in Uzbekistan. 120.8 billion kWh by 2030.

Source: <http://minenergy.uz/uz/lists/view/32>

Resolution of the President of the Republic of Uzbekistan No. PP-4779 in 2020 on additional measures to reduce the dependence of the economy on fuel and energy products by increasing energy efficiency and attracting available resources. Expanding the full use of renewable energy sources and creating the

necessary conditions for the development of hydrogen energy is becoming an important task.

In accordance with the Presidential Decree No. PQ-5063 dated April 9, 2021, the International Solar Energy Institute was opened in Uzbekistan. At the same time, in 2010 it was possible to use hydrogen fuel, namely, as energy accumulators. The production of energy by using the energy produced at the "Green Hydrogen" QTEM stations and the decomposition of water H₂O molecules into 2 hydrogen atoms 2H and oxygen atom O using electrolysis technology has been launched. This process is environmentally friendly and ends with the release of only pure oxygen into the atmosphere (environment), hydrogen is delivered to the consumer through pipes, in tanks installed in vehicles.

Hydrogen is obtained directly from electricity, firstly as a fuel and secondly as a fuel cell. In addition, clean drinking water is obtained as a result of this process. From the point of view of "green energy", the utilization rate of hydrogen fuel is very high, 90%. (even the efficiency of the internal combustion engine is 35-40%). The efficiency of solar power is only 15-20%. The best, strong wind power plants have an efficiency of up to 40%. In addition, the production of wind and solar electricity requires favorable weather, the provision of valuable services. The possibility of making hydrogen batteries in real life is cheap and they are used as electricity in households, transport, medium and large industrial facilities.

In summary, the total potential of solar energy in Uzbekistan is 51 billion. tons of oil equivalent. The sun shines all year round, and strong air currents form in the plains. Our country has all the opportunities for wind and solar energy production. The energy that falls from the sun to the earth in an hour is more than the energy used in any given year in the world. It should be noted that hydrogen, which is a pure fuel, is also important.

Because hydrogen is not freely available in nature and is only produced from other energy sources, it is known as an energy carrier, and when it combines (adds) with oxygen, it produces heat and electricity only with water vapor as a by-product. Today, much of the hydrogen production is done through natural gas. The average annual amount of electricity generated in the country is 69-72 billion kWh, and it is planned to double this figure by 2030.

On the basis of public-private partnership, the project will cost 7.4 billion soums. A total of 19 projects worth USD were implemented and signed. Today, at a time when energy is produced in developed countries (USA, EU, China, Japan, South Korea, etc.), this figure is less than 5% in Uzbekistan. According to the "Concept of full supply of electricity to Uzbekistan in 2020-2030", developed and approved by the Ministry of Energy, it is planned to develop QTEM power plants using 5 GW / h solar photovoltaic plants and 3 GW / h wind power plants.

In practice, there is interest from foreign investors interested in investing in Uzbekistan's energy, which will be attended by 1,500 investors from 56 countries at the International Investment Forum in Tashkent on March 26-28, 2022, and several projects aimed at developing renewable energy. 70 companies have applied for participation in the project to build a 100 MW / h wind farm in Karaozak district. 54 companies participated in the tender for the construction of Sherabad solar photovoltaic plant. A solar photovoltaic plant with a capacity of 100 MW (2021) has been commissioned in Karmana district of Navoi region. This solar photovoltaic plant (KFES) generates 260 million kWh of electricity per year. KW / h of electricity.

This is equivalent to 80 million m³ of natural gas in Uzbekistan. \$ 70 million was spent on the project. Also, in Katta-Kurgan district of Samarkand region and Gallaorol district of Jizzakh region, for the construction of QFES, the company "Masdar" is building stations with a capacity of 220 MW / h each in these two regions. At the same time, a substation with a capacity of 457 MW / h was built in

Surkhandarya. 250 MW / h in Bukhara region 150 MW / h in Namangan region. 100 MW / h in Khorezm region. 300 MW / h in Kashkadarya region. Construction of a 100 MW substation has begun in Fergana region. By 2026, the amount of energy produced by solar and wind power plants will be 6 times more than the energy needs of the Republic.

On March 25-26, 2022, the Tashkent International Investment Forum will be held, where 7 billion US dollars will be spent on the production of QTEM energy, and 1.2 billion US dollars will be spent annually in Surkhandarya. It is planned to produce kWh of electricity.

Conclusions and suggestions. Today, a wind map has been developed in the Republic of Uzbekistan, according to which the total potential of wind energy is 2.2 million tons. is estimated. Its technical capacity is 0.5 mln. t.n.e.ga teng. In addition, 75% of the territory of the Republic was assessed as usable for wind power generation. Because these lands consist of plains. Wind currents in these areas are seasonal. It is also observed that Q.T.E.M. has high production costs and less power than conventional energy sources.

It should also be noted that clear financial mechanisms for measures to encourage the application of Q.T.E.M. have not been developed and an adequate legal framework has not been formed. If we focus on the World Experience, Q.T.E.M. There are a number of economic mechanisms that encourage use. Within the framework of these mechanisms, we can see that the "Green Certification" and "Green Financing" systems are very effective. The "Green Certification" system is a Q.T.E.M. is a tool for the production, use and monitoring of electricity. This system is widely used in the world and is called "Green Certification", "Renewable Energy Certificate", "Renewable Energy Credit", and "Green Label".

Today, the following tasks are set as a priority for the energy policy of the Republic:

- a) Q.T.E. traditional sources of electricity based on diversification of fuel balance through extensive use of resources Q.T.E.M. to achieve a sharp reduction in the share of fossil fuels in the production of electricity and heat at the expense of replacement.
- b) Reducing the energy intensity of GDP and the widespread introduction of energy-saving New Digital Technologies (Big data, Blockchain) in production and adaptation to climate change, reducing its negative impact, improving the environmental situation in the regions.

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