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PROSPECTS FOR USING WIND AND SOLAR ENERGY IN UZBEKISTAN

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ABSTRACT:

The article is devoted to the analysis and assessment of energy activity in the use of renewable sources of wind and sun electrical energy in Uzbekistan. Since there are areas in Uzbekistan where there are frequent winds, it has great potential for generating electricity through the use of wind power plant. This potential is only slightly used in practice, while the scale can be significantly increased, since the demand for electricity is constantly increasing. Solar energy is in the same position, since in Uzbekistan the number of sunny days is on average 250-270, sunshine is observed for 2850-3050 hours a year, and only a small part of this potential is used. For 10 years, it is planned to build photovoltaic solar power plants (SPP) with a total capacity of 5000 MW and wind power plants with a total capacity of 3000 MW. It will be a significant alternative to traditional energy used in the country.

KEYWORDS: energy, wind energy, solar energy, renewable energy, energy sources, wind or solar energy installations, wind power plant, solar power plant.

INTRODUCTION:

The presence of energy is one of the necessary conditions for the existence of human civilization. Energy consumption in every country in the world is growing from year to year, since, despite energy-saving installations, more and more innovative developments and installations, services using the digital economy appear in the world. In 2019, global electricity consumption grew by about one per cent or 357 TWh. This is quite a little compared to the average annual growth rate in the period 2010-2019. (+ 643 TWh) [14]. In addition, the great importance in the field of energy consumption is the fact that when using traditional sources of energy, they are not only depleted, but their very consumption significantly worsens the Earth's ecology, having a detrimental effect on flora and fauna, including human health and livelihoods, both through direct impact and indirect, through the consumption of products, the quality of which also depends on the negative impact of the deterioration of the environmental situation.

Research into the efficiency of energy generation and use has been going on for quite some time. And in this area, research is carried out by scientists of Uzbekistan, taking into account the climatic and financial characteristics of the regions of the country [2,5,6,10, 11].

RESEARCH METHODOLOGY

The article used statistical and comparative analysis for analyse the changes that have occurred both in the country and in the world. Empirical analysis, at the same time, allows you to explore the useful component of the application of wind or solar energy installations.

ANALYSIS AND INTERPRETATION OF DATA

The power industry is based on fuel reserves of hydrocarbons (coal, oil and gas). They are the basis for obtaining 90% of energy.

However, these energy sources are limited and depleted over time more and more. This is the reason that for many years scientists have been working on ways and methods of obtaining energy from alternative sources. At the same time, they can be very different and very varied sources: not only solar batteries and wind energy, but also the ocean, algae,

certain types of garbage, human steps, volcanoes, geysers and many others. However, in spite of such a variety sources of alternative energy, the methods of obtaining it in the required volumes, as well as their reduction in price, remain a problem.

There are four areas of energy (Table 1): traditional fossil fuels, hydropower, nuclear power, alternative energy sources.

Table 1: The structure of world energy consumption, % [2; 8]

№	Source	2001	2020
1	Traditional fossil fuel energy	85,2	20,1
2	Atomic Energy	6,5	7,0
3	Hydropower	7,0	9,0
4	Alternative energy sources	1,3	30,0
	Total	100,0	100,0

Energy of motion: if something moves, then it has kinetic energy, it can move forward, rotate, or be caused by oscillatory movements. And the greater the mass and speed of the object of motion, the more kinetic energy it has. Mechanical energy is also part of the kinetic. This is the energy of movement and the accompanying interaction. Electrical energy is the energy produced by a stream of negatively charged electrons, and the faster they move, the more energy is generated. An example is a lightning strike.

Let's take a closer look at the classification of individual alternative energy sources:

- wind power. Wind power – the energy industry associated with the development of methods and means the converting wind energy into mechanical, thermal or electrical energy. Wind energy has all the advantages characteristic of alternative energy in general (environmental friendliness, renewability, low operating costs).

With a wind turbine, wind energy can be converted into kinetic energy.

Wind power plant – a complex of interconnected equipment and structures designed to convert wind energy into other types of energy (mechanical, thermal, electrical, etc.) [4].

To date, in the practice of using wind energy, two main plant designs are used: horizontal-axial and vertical-axial wind turbines. At the same time, in spite of the fact that both installations have equal efficiency, wind generators of the first type are more used. Their power can be from hundreds of watts to several megawatts.

Wind turbines are classified according to the following criteria [4]:

- By type of generated energy;
- By Power;
- By application;
- By appointment;
- On the basis of work with constant or variable speed of the wind wheel;
- By management methods;
- By the structure of the power generation system.

According to the report of the European Wind Energy Association Wind Europe «Wind energy and economic recovery in Europe», the number of people employed in the wind energy sectors in the European Union, as well as in the UK, is 300 thousand people, and the share in European GDP is 37 billion euros.

EU governments plan to install twice as much wind capacity by 2030 than currently installed, which will create 50% more jobs. At the same time, wind energy will cover 30% against 15% of today's electricity consumption in Europe, and its share in GDP will grow to 50 billion euros [7].

Table 1: Macro-economic benefits of wind energy under Wind Europe's 2030 scenarios [15]

Indicator name	low scenario	central scenario	high scenario
share of wind in EU electricity demand in 2030, %	21,6	29,60	37,6
Jobs in 2030	438000	569000	716000
Investment in 2030, million euros	147000	239000	351000

Wind Europe says investment in wind energy will help European economic recovery after coronavirus downturn. Each new turbine installed generates about 10 million euros in revenue for everyone involved in its creation and installation, namely those involved in scientific research devoted to this, planning, production of parts, construction and transportation.

In addition, the increase in wind power will strengthen the economic power of Europe in this industry, as 5 of the 10 world's leading turbine manufacturers are located in Europe. Moreover, they account for about 42% of the world market. The tax component from wind energy is also not small - 5 billion euros, which go to rural municipalities. And also some communities participate in the ownership of local wind farms. At the moment, the total capacity of European wind energy is 197 GW. With the full implementation of the plans established for 2030, it can reach 397 GW under the optimistic scenario and 324 GW under the pessimistic scenario, although this is also far from a small indicator [15].

Establishing the use of wind energy in Uzbekistan is one of the most important priorities in orienting the new Uzbekistan in an innovative direction. To support this priority, the Decree of the President of Uzbekistan Sh. M. Mirziyoyev dated May 26, 2017 No.PP-30-12 "On the program of measures for the further development of renewable energy, energy efficiency in the sectors of the economy and the social sphere for 2017-2021" was adopted. This decree supports the conduct of scientific research in this industry, as well as actions to establish the production and sale of power plants for the establishment of wind energy in the regions of Uzbekistan. The decree plans to increase the capacity of wind power by 2021 by 102.0 MW.

At the same time, there are a large number of constraining factors, namely, unfortunately, there are no effective incentive measures for the introduction of wind power plants, as well as the use of wind energy by consumers, as well as the need for high capital investments from both potential producers and consumers of wind energy, while to implement such projects, it is necessary to establish local production of wind generators of various capacities, as well as components, since all projects for the use of wind energy in the republic are focused on imported equipment, which is a rather expensive purchase and, in turn, makes energy production expensive and inaccessible.

Establishing local production of wind turbines and components, taking into account the developed localization programs, would improve the efficiency of wind energy development and reduce dependence on the use of traditional energy.

Solar is another source of renewable energy that is widely used. It is an effective competitive alternative to traditional energy, since its production does not pollute air, water, the environment, and also does not pose a threat to human life. Scientists have calculated that 18 sunny days on the planet has the same amount of energy as the reserves of coal, oil and natural gas of the planet. On average, a square meter on our planet collects 4.2 kilowatt-hours of energy daily, which is equal to the energy equivalent of almost a barrel of oil per year, if we talk about a square meter of

hot desert, then this is more than 6 kilowatt-hours per day per square meter on average [9].

French scientist Edmond Becquerel discovered in 1839 that certain materials are capable of emitting sparks of electricity when struck with sunlight. This property was later called the "photoelectric effect" and was used to create the first photovoltaic cell, and in 1950 scientists, using silicon converted into photovoltaic cells, began to use it to convert solar energy into electricity. The sun's energy is converted into electricity in one of two ways: thermodynamic and photovoltaic.

Solar energy in Uzbekistan has the greatest potential compared to any other alternative energy sources. The data show that the average number of sunny days in the country is 250-270, sunshine is observed for 2850-3050 hours a year, the potential of solar energy is about 50.9 billion tons of oil equivalent [11].

In 2013, the International Institute of Solar Energy was established in Uzbekistan on the basis of Physical-Technical Institute of SPA "Physics-Sun" Uzbekistan Academy of Sciences together with the Asian Development Bank in the capital. Its goal is to become a regional centre for scientific research and experimental work in order to develop promising technologies in this area.

The construction of the first solar photovoltaic plant in Uzbekistan has begun in the Pastdargom district of the Samarkand region. Further, it is planned to build such plants also in other six regions of the republic, in particular, in the Surkhandarya region, according to the project, at the site selected for its implementation, located in the Sherabad district of the Surkhandarya region, a photovoltaic plant with a capacity of at least 200 MW of alternating current will be built, including a new 220 kV substation and a 52 km power transmission line for connection to the 220 kV Surkhan substation [12].

In addition, in 2012, a plant for the production of technical silicon with a capacity of 12 thousand tons per year was put into operation in the Navoi region, on the territory of the Angren free industrial zone of the second plant for the production of silicon, with a capacity of 5 thousand tons per year, as well as in 2014, the production of photovoltaic panels was launched on the territory of the Navoi free industrial-economic zone, and in the special industrial zone “Jizzakh” an enterprise for the production of solar thermal collectors with an annual capacity of 50 thousand units [3].

For several years, the republic has been implementing plans for the production of energy-efficient houses using solar energy technologies in rural areas, in urban areas by individual organizations, including for urban lighting, establishing the use of electricity for traffic lights, however, there is still little experience in using solar energy in city houses, educational and medical institutions, in the form of the use of water heaters for a number of residential buildings, factories, sanatoriums. This is hindered by a number of factors, namely, the high cost of manufacturing solar panels, the lack of weighty criteria for stimulating the development and spread of the use of solar energy and solar energy, the need for dust-proof installations in the region, the need for considerable costs to prepare for the installation of photovoltaic panels, as well as their installation and maintenance.

However, these issues are solvable when the required amount of investment is invested in the implementation of the relevant work. That is why, the resolution of the President of the Republic of Uzbekistan "On accelerated measures to improve the energy efficiency of economic and social sectors, the introduction of energy-saving technologies and the development of renewable energy sources" in according to which it is planned to increase the share of renewable energy sources to 25%

by 2030, including for the period 2020-2030, forecasts of an increase in the share of electricity generation and generating capacities up to 1487.6 MW, 11.2%, for solar power industry increase in capacity to 4300 MW, which in the total generation volume is 8.8%. For 10 years, it is planned to build photovoltaic solar power plants (SPP) with a total capacity of 5000 MW and wind power plants with a total capacity of 3000 MW [1]. By the end of 2021, Uzbekistan plans to commission two photovoltaic (solar) power plants of 100 MW each.

BloombergNEF published its Power Transition Trends 2020 report, which noted that solar energy capacity reached 651 GW in 2019, thanks to the introduction of PV solar power plants with a total capacity of 118 GW, thereby bypassing wind power, the total capacity of which amounted to 644 GW. Solar power capacities in excess of 1 MW were commissioned in 81 countries of the world in 2019, thanks to them 2.7% of the world's electricity was produced, which was 0.16% a decade ago. According to BloombergNEF forecasts, 140-178 GW of solar plants will be built in the world in 2022, while wind energy currently generates 2 times more electricity per year. Solar and wind energy together accounted for two thirds of 265 GW of generating capacity commissioned in 2019 [13].

CONCLUSION:

In terms of installed capacity, solar photovoltaic energy ranks fourth after coal, gas and hydropower.

For the widespread distribution of installations for the generation of wind energy and solar energy, it is necessary to develop and approve state standards and other legislative and regulatory acts in the field of renewable energy sources. At the same time, legislative and regulatory acts should contain weighty criteria for stimulating the population and legal entities to use alternative energy. In addition, it is necessary to carry out activities to improve the literacy of the population in the use of solar and wind energy.

To stimulate the implementation of the most promising investment projects and technologies for the generation and use of wind and solar energy, using the experience of implementing foreign technologies. Creation of joint ventures by attracting foreign investment and specialists, to expand the production of equipment, components and materials used in technologies related to the use of alternative energy sources in the country.

In addition, it is necessary, on the basis of the existing scientific potential of the country and in cooperation with foreign research centres, to organize experimental and applied research related to the use of alternative energy sources at the International Institute of Solar Energy and other scientific institutions of Uzbekistan.

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