ISSN 1512-1461

UDC: 551.94.21

ALTERNATIVE ENERGY SOURCES AND PECULIARITIES OF MAINTAIN -VALLEY WINDS AS DEPENDENT ON THE LOCAL RELIEF

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ABSTRACT

In this work to overview sources of alternative energy and shows the results of scientific research of mountain-valley winds in arbitrary local Relief. The features of mountain-valley winds are considered, depending on the complex geographic conditions of the region. The dynamics of the loss of wind speed during zigzag flow through mountain gorges and narrow passages is analyzed and the effect of these losses on the wind flow characteristics. It is planned to conduct scientific research to determine the available wind potential and to bring the profitability of a particular type of alternative energy sources in the South Caucasus.

Keywords: *Application of economics, alternative and Renewable Energy Sources.*

1. INTRODUCTION

President of the Republic of Azerbaijan Ilham Aliyev chaired the Cabinet of Ministers meeting on the results of the first quarter of the year and the forthcoming meeting[3].

... We now export electricity to neighboring countries. We are fully satisfied with all our needs throughout the country. However, we must look at how much generating forces will need us. We must take into account the development of our country, population growth, industrialization process. That is, considering the great development, we need to look at how much electricity is needed for our domestic consumption after five years and ten years. In parallel, we have to analyze foreign markets, how much energy we export to the foreign markets after five years, ten years. ... We must create alternative energy sources - wind, solar, hydroelectric power stations. SOME ISSUES WERE EXAMINED IN THIS FIELD AND I SUBMITTED[3].

2. THE SITUATION OF ALTERNATIVE ENERGY

Worldwide drop in oil and gas reserves, their production decline is unavoidable and necessary in today's and future near-term non-traditional energy sources. Alternative energy sources include the following: 1). Wind energy; 2). Solar energy; 3). Hitchhiking; 4). Energy of rivers; 5). Geothermal; 6). Biofuel; 7) Thermo-nuclear sintez

Solar energy - the solar energy here, of course, the light and heat energy reaching the earth should be understood. The light and heat of the sun play a major role in the life of the earth. Its energy split into the universe in a year is $4x\ 10^{23}$ kilowatt x hour . In a year approximately $2x10^{18}$kW sunlight energy falls to Earth surface. This energy is 30 thousand times more than one using by people in the world. 1.36 kW (1.36 kW / m^2) solar radiation energy falls on the per 1m2 of perpendicular placed on Sun radiation surface outside the Earth's atmosphere.

ISSN 1512-1461

Atomic energy can also be considered as an endless source of energy. However, the experience of nuclear power plants (AES) shows that they are not safe, their structure and operation should be further improved technologically.

The use of alternative sources of energy and wind energy, especially in today's crucial issues, is due to the collapse of the ecological situation in the 21st century for the known reasons, the loss of carbohydrates in the world and the increasing demand for energy from the world. Installation of wind installations and solar panels is not accompanied by any environmental pollution (contamination) in the environment. These facilities are available in many parts of the world, as well as in Absheron, suitable for installation and recycling. Wind machines can be used to overcome the energy crisis in our Republic.

The wind is the result of this movement (air flow), and it has a constant energy that can not be exhausted. People have used this energy from ancient times to this day. Over time, as science and technology have evolved, people's wind and energy use have improved and expanded. Winds on Earth are the result of sun exposure to the atmosphere. Of course, there are factors such as the geographical location of the earth, the rotation around its axis and, as a consequence, the unequal heat of the sun.

It is believed that the first wind turbines were installed two thousand years ago in China, Japan and Tibet. At the time of our era, wind engines existed in Egypt, the Middle East, and in ancient Azerbaijan.

Wind power today is declining in dozens of countries around the world, in the past and in the prime of the practicality of the venue in the land of Earth. Some of the electric motors are generated in Denmark by 19%, in Ireland - 14%, in Spain - by 16% and in Germany - by 8% [8] .

At present, the power of Azerbaijan's energy system is 7.2 thousand megawatts. The total capacity of alternative and renewable energy sources is 12,000 megawatts. [4]

In the work[7], on the basis of the hydrodynamic equations, changes of speed of wind - kinetic energy of a stream of air, caused by influence of a local relief have been studied. In the given work, on the basis of the hydrodynamic equations, have been studied changes of speed of wind - kinetic energy of an air stream, caused by influence of a local relief. In system of the equations for the description of so-called "effect of friction" on the Earth's surface has been offered new approach.

On the path of the wind flow, an artificially created obstacle contributes to the appearance of turbulence, eddies and the variation of the air circulation in a given locality (see [2, 9])

(Figure 1.):

Fig.1. The onset of turbulent force - The rock in the path of the wind flow

ISSN 1512-1461

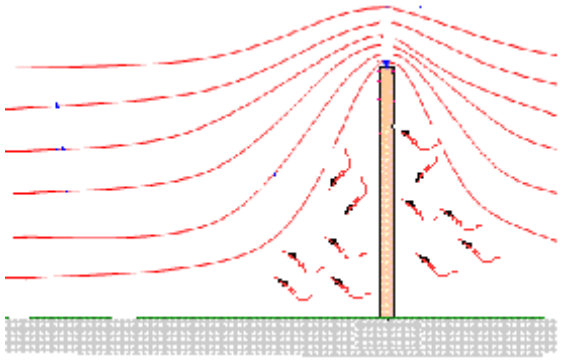

Fig 2. The emergence of turbulent force - Artificial wall in the path of the wind flow

With effective obstacle resistance, the horizontal wind flow slows down and the vertical velocity of the wind flow increases and deformation of the air flow occurs. Vertical movements of the wind flow in the mountainous terrain are much greater than in the open area. The horizontal velocities of the wind flow (V) are found from the formula: $V = V_h(1 - K_3)$, Where: V_h - speed of vertical movement of the wind flow; K_3 is the coefficient of retardation of the wind speed.

The deceleration factor K3 takes into account the height, width and shape of the gorge. K3 we find by the formula: $K_3 = \sqrt{C_{rse} + 0.5C_{sg}(1-\eta)P_g \sum \frac{h}{b}}$, where C_{rse} and C_{sg} - factors of resistance of a surface of the earth and slopes of gorges. $C_{rse} = 0.003$ and $C_{sg} = 0.6$; P_g is the density of the gorge; h; b - average height and width of the gorge; η is the permeability of the wind to the gorges.

Elevations in the mountains significantly affect the movement of the wind. Even small changes in altitude cause changes in wind speed. As a result, the movement of the air stream becomes turbulent and remains the same at a certain distance even on the plain.
In the turbulent flow, a continuous random vortex movement of air in all directions is observed, which requires more energy and creates more resistance to the air flow. According to the law of conservation of energy, the mass of air flow through the width of the canyon is equal to the mass of this stream flowing into a wide valley: $\frac{F_1}{m_1} = \frac{F_2}{m_2} = const$, where, m_1 is the mass of the air stream; F_1 - width of the gorge or canyon; m_2 - the mass of this flow flowing into a wide valley; F_2 is the width of the valley.

It can be seen from the formula that the velocity of the air flow is inversely proportional to the cross-sectional area of the gorge and vice versa [2].

High-speed head of air flow flowing through the width of the gorge or canyon, we determine by the formula: $q = \frac{\rho V^2}{2}$, where: q - high-speed air pressure; ρ - density of air; V - air speed.

Значение силы напора воздушного потока определяем по формуле: $X = c_x \frac{\rho S}{2} V^2$

The value of the force of the head of the air flow is determined by the formula: $X = c_x \frac{\rho S}{2} V^2$, where: ρ - density of air flow; S - the cross-sectional area of the gorge or canyon; V - speed of wind flow; c_x - the drag coefficient of the drag. $E_{kin=} = mV^2/2$ -

ISSN 1512-1461

The kinetic energy of the air flow is $E_{kin=} = mV^2/2$: where: m – масса воздуха,; m - mass of air, $kg \cdot s/m^2$; V - speed of air flow, m / s

The potential energy $E_p = PFS$ of the air flow where: P - air pressure, $kg \cdot s/m^2$; S is the cross-sectional area of the air flow, m^2; F - the path covered by 1 kg of air flow through this section, m .

The wind continuously changes and the average power of the air flow passing through the cross-sectional area of the gorge or canyon in a certain time limit is found by the formula: $W == \frac{\rho V^3 F}{2}$, Where: ρ - density of air; F is the cross-sectional area of a gorge or canyon, m^2;

Для достижения поставленной цели планируется сформулировать и решать следующие задачи:

To achieve this goal, it is planned to formulate and solve the following tasks:

S - the path covered by 1kg of air flow through this section, m;

Figure 3 shows the histograms of repeatability for how long and at what speed in the year the wind blew for 2015 in the Sharur region of the Nakhchivan Autonomous Republic. The histogram of wind speeds allows us to present the distribution of wind speeds for the seasons of the year:

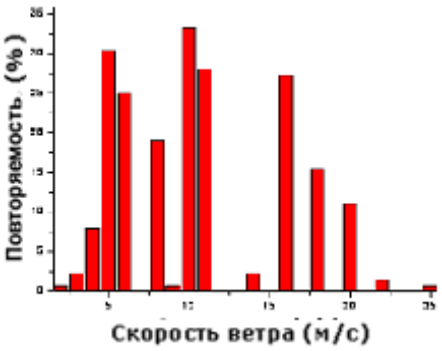

Figure 3.

CONCLUSIONS

Features of mountain-valley winds depending on height, density, pressure, terrain and geographic features of the Nakhchivan basin are considered.

The dynamics of the loss of wind speed during the encounter of various obstacles on their way and the effect of these losses on the wind flow characteristics are analyzed.

The results of scientific research of the wind energy potential of the Nakhchivan Autonomous Republic are shown, which has a complex geographic relief.

Talk given at the 6th International Conference on Control and Optimization with Industrial Applications".(11-13, July, 2018, Baku, Azerbaijan).

ISSN 1512-1461

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Article received: 2018-10-19