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DEVELOPMENT OF ALTERNATIVE ENERGY IN REPUBLIC OF BELARUS
РАЗВИТИЕ АЛЬТЕРНАТИВНОЙ ЭНЕРГИИ В РЕСПУБЛИКЕ БЕЛАРУСЬ

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First of all we will start with the definition of alternative energy. Alternative energy is complex of promising methods of obtaining, transferring and using energy. This complex is in demand because it doesn't cause significant harm to the environment. Alternative energy includes energy from the sun, wind, hydroelectric energy, biomass and others. And now let's look closer at each of them [3].

Solar energy. Energy from the sun is the form of radiation and light. Known as solar energy, this powerful and unlimited source of energy would offer us a very efficient alternative to oil, and it is free resource. This energy largely controls the climate and weather and is basis of life. Solar energy can be used to generate electricity and heat. Solar panels are necessary to obtain energy. Photovoltaic cells consist of one or two layers of a semi conducting material, usually silicon. When light shines on the cell it creates an electric field across the layers, causing electricity to flow. The greater the intensity of the light is, the greater the flow of electricity is. It is important to understand that it is not enough just to install solar panels on the roof of a building, it is necessary to use them correctly, take appropriate measures to maintain and improve them. Recently solar energy has been developed among European countries. Belarus followed example and began to develop this area too. Thus production increases. For example in 2015 – 13 MWatt, in 2019 – 154,3 MWatt [1].

Wind power is kinetic energy of moving air. In general terms, the potential for wind power generation depends on the following four factors:

– latitude and prevailing with patterns,
– relief and height,

– reservoirs,

– vegetation and development of the territory.

The transformation of kinetic energy into electrical, mechanical or some other can be done by devices such as wind generators, windmills and sails. Windmills were used to grind grain in Persia as early as 200 B.C. Mills of this type were widespread in the Islamic world and were brought to Europe by the crusaders in the 13th century. A revival of interest in wind energy began in the 1970s after 1973 oil crisis. The crisis depends on many countries on oil imports and has led to the search for options to establish this dependence. In the mid-1970s, Denmark began testing the predecessors of modern wind turbines. Later, the Chernobyl disaster spurred interest in renewable energy sources [2].

The first known mill on the Svisloch River appeared during the foundation of Minsk, but information about the first windmills on the territory of Belarus dates back to the XVI-th century.

On the territory of the republic 1840 sites have been identified for the placement of wind turbines with a theoretically possible energy potential of 1600 Mwatt and an annual electricity generation of approximately 2.5 mlrd kWatt in hour. The country's first industrial wind power plant of a megawatt class was an installation near the village Grabniki, Novogrudok district, whose electric power is equal to 1.5 Mwatt. We can conclude that in the conditions of the Republic of Belarus it is advisable to generate electricity in industrial volumes using wind energy.

Hydroelectric energy is the area of economic and human activity, a set of large natural and artificial subsystems that serve to convert the energy of a water flow into electrical energy. There are two sources of energy in hydropower production. The first is a powerful surge of water sluicing over a cliff that creates a tremendous source of energy. Hydroelectric energy is another clean alternative to oil, since it does not produce waste of pollution. The second is tidal energy. It is the power of water that can also be harnessed on a smaller scale by the use of tidal flow. There are some advantages and disadvantages of hydroelectric energy [2].

Advantages:

– Use of renewable energy

– Cheap electricity

– Work is not accompanied by harmful emissions into the atmosphere

– Climate migration near large reservoirs

Disadvantages:

– Flooding of arable land

– Construction depends on large reserves of water energy

– Dangerous on mountain rivers due to the high seismicity of areas.

Belarus is a flat country. The speed of the river flow is not high here. Potential for the use of hydropower resources does not exceed 250 MWatt and is

concentrated in Grodno, Vitebsk and Mogilev regions in the sections of the basins of the Neman, West Dvina and Dnepr rivers [4].

Biomass is the total mass of plant and animal organisms present in a biogeocenosis of a certain size or level. Animal waste, rotten crops and grains, residues from wood mills and aquatic waste can be all be fermented to form in alcohol that is comparable to coal in its energy producing powers. It also produces greenhouse gases, making it one of the less attractive alternative energy sources.

Biomass of the Earth is 2420 billion tons. It is the largest renewable resource in the world economy. The main part of biomass fuels (~80%) is wood, which is used for heating houses and cooking in developing countries [5].

Wood has been used as fuel everywhere since ancient time.

There are over 300 operating installations for the production of electricity from renewable sources with a total installed capacity of 500 MWatt, including: 98 installations from the use energy of wind (100 MWatt), 95 – on the use of solar energy (more than 150 MWatt), 29 hydropower plants (86.06 MWatt), 32 plants for the production and use of biogas (41.3 MWatt).

Belarus is not characterized by good wind potential, but still there is a possibility of using wind energy. So, we can say that use of wind and solar energy are more popular than others. In our country, wood fuel is still actively used, mainly for the production of thermal energy. For these purposes logging and woodworking waste is used through transformation into chips or pellets.

The disadvantage of these technologies is the instability of work. Because sun and wind depend on weather conditions. Also the construction of installations for the use of energy sources has high costs. The share of primary energy production from renewable energy sources to the gross consumption of fuel and energy resources should be: in 2020 – 6%, in 2030 – 8%, in 2035 – 9% in Belarus [4].

At the moment, the branch "Resource Center EcoTechnoPark - VOLMA" UO "RIPO" has a demonstration site with samples of installations that use renewable energy resources for energy production. These are wind power plants, solar batteries (donated by the Land of Vorarlberg (Austria); micro-hydroelectric power plants and a boiler house on woody bio-raw materials (installed with the financial support of the Land of Vorarlberg (Austria) and the mediation of the Otto Hug Institute (Munich, Germany) [6].

The stand-alone paddle wind power plant of the farm type VEU-6 is one of the objects of this site. The design of the VEU-6 allows the generator to start charging the battery pack at a wind speed of more than 2 m/s. Consumers are connected to the unit through an inverter that converts the energy stored in batteries (24 V, 760 A / h, 10 kWatt / h) into a voltage standard for most consumers of 220 V, 50 Hz. Such a scheme allows at any time, regardless of the presence and speed of the wind at a given time, to provide consumers with electricity.

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DROHNENANWENDUNG IN LOGISTIK
ПРИМЕНЕНИЕ ДРОНОВ В ЛОГИСТИКЕ

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Drohnen werden in vielen Branchen eingesetzt. Sie helfen Unternehmen und Menschen, Wissenschaft und Umwelt. Aber Drohnen sind in erster Linie ein integraler Bestandteil der zukünftigen Lieferindustrie. Der nicht-militärische Einsatz von Drohnen wurde vor 20 Jahren ermöglicht, als der GPS-Rundungsalgorithmus auf 100 m für den zivilen Einsatz abgeschafft wurde. So können Transport- und Logistikdrohnen nun frei Waren liefern und das Funktionieren von Logistikstrukturen entwickeln [2].

Wo funktionieren Drohnen bereits? Unbemannte Luftfahrzeuge - Drohnen - sind eine neue Entwicklung in der Technologie. Ferngesteuerte Drohnen entstanden mit der Erfindung des Radios. Die Erstellung des ersten funktionierenden Gerätes wird mit dem berühmten Erfinder Nicola Tesla in Verbindung gebracht.

Im 21. Jahrhundert schien, dass die Gesellschaft die Möglichkeit bemerkt hatte, Drohnen für zivile Zwecke einzusetzen. In den letzten zehn Jahren hat sich die Zahl rapide erhöht.