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ASSESSMENT OF SOLAR ENERGY POTENTIAL OF ZHYTOMYR REGION AND THE APPLICATION OF PHOTOVOLTAIC DEVICES FOR ELECTRICITY PRODUCTION

Traditional ways to generate electricity are not environmentally friendly. Therefore, energy should be developed first and foremost in the direction of improving safety of power plants operation, the introduction of waste-free technologies for the use of fuel and the development of alternative "clean" sources of energy.

The sun is the most powerful source of clean energy. About 1300 watts of solar energy penetrate every square meter of the Earth's atmosphere.

The most efficient method of using electricity is converting radiation into electricity by means of solar panels. A solar panel is an electrical installation that generates current and is made of solar modules oriented toward the sun and having common loadbearing construction.

The topicality of the work is caused by the need to obtain relatively cheap electricity in the required volumes. Stimulation of the development of solar energy in Ukraine will contribute to strengthening the energy security of our country, creating a strong base for investment (including international), rapid growth of indicators of science and technology development, as well as solving environmental and social problems.

The solar energy potential in Ukraine is high enough for widespread use of both heat and photovoltaic equipment in all areas. The economic life of solar power equipment in the southern regions of Ukraine is 7 months (from April to October), in the northern regions - 5 months (from May to September). Photovoltaic equipment can be used throughout the year.

On 01.01.15, there were 98 solar plants with a total installed capacity of 819 MWth operating in Ukraine. They generated 485 million kWh of electricity in 2014.

The average indice in Ukraine (1,074.1 kWh/year and 12.3%) is slightly below the European level (1121.5 kWh/kWh and 12.8%), which is a good result.

The transformation of solar energy into electrical energy in Ukraine should focus primarily on the use of photovoltaic devices. Large reserves of raw materials, industrial and scientific and technical facilities for the manufacture of photovoltaic devices can provide not only the needs of the domestic consumer, but also represent more than two-thirds of the production for export deliveries.

Solar potential can be determined by two methods: calculation and measurement. In the paper, we will consider both methods, but in the subsequent calculations, we used the data of the calculation method.

After the analysis of the first part of the calculations, we can conclude that the intensity of direct solar energy is greater when sunlight enters the surface

perpendicular to sunrays direction. The highest intensity of solar energy is observed at 12 AM in both cases.

Nowadays, the use of autonomous appliances for heating buildings, flats, houses as well as for water heating and electricity generation is becoming increasingly popular. For the latter, solar panels and so-called windmills are most commonly used.

The total annual solar energy potential for the city of Zhytomyr is about 313.1 kW/m². The potential amount of solar energy that can be obtained from a unit of area by installing polycrystalline solar panels, which are the most efficient in terms of price and quality, is 43.8 kW/m².

Knowing the electricity costs of Zhytomyr Polytechnic State University for the year, we can determine the required area of solar panels for the university (main building).

The area of the main building of the university is 15 48,3 m², and the roof area where solar panels could be installed is 7 741,7 m².

The possibility to cover electricity costs directly depends on the generation of a given amount of energy by solar panels, which is influenced by the distribution of solar radiation in the territory by months.

As far as today 1 kW of electricity at a regular tariff costs UAH 3.50, annually Zhytomyr Polytechnic State University pays for electricity on average 697 456.2 UAH. Considering the amount of electricity produced by the Solar Power Stations (SPS), the sale of residual energy at the “green tariff”, as well as the payment for months when the energy produced does not fully cover the costs, the net income for the year is expected to be 395 949,6 UAH.

As the volume of initial investments is 1175172,00 UAH and the annual profit is expected to be 395949,6 UAH, the payback period is about 3 years.

Therefore, solar power plants are becoming to operate extensively in our country. It is a leading branch of the future power industry. The operation of such plants will reduce maintenance costs, completely eliminate the cost of fuel and most importantly, reduce emissions of harmful substances into the atmosphere by reducing the operation of traditional power plants on solid fuels.

Autonomous SPS for home use can provide energy without electricity consumption from the grid. Thus, it saves money, reduces the risk of low electricity current caused by line breaks and makes the consumer completely independent in the energy issue.