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ASSESSMENT OF THE EFFICIENCY OF SMALL CAPACITY WIND TURBINES FOR OFF-GRID MONITORING STATIONS IN CHERNIHIV REGION

Automated autonomous hydrometeorological measuring stations are widely used to measure hydrological parameters, forecast climate change and to respond quickly to changes in water levels during floods. Reliable operation of these objects depends on the continuous operation of the power supply. Recently, renewable energy sources are increasingly used in the power supply systems of such stations.

The main factors determining the focus on the use of renewable energy sources are the desire to increase the reliability and efficiency of energy systems, using innovative technologies to increase energy availability, ensure a high level of environmental and climatic safety.

Solar panels are usually used in combination with batteries to power autonomous monitoring stations, but it is possible to use them in combination with low-power wind turbines to increase the autonomy of stations.

The purpose of this study is to consider the efficiency of the use of wind turbines by analyzing the energy potential at the installation site for the Chernihiv region.

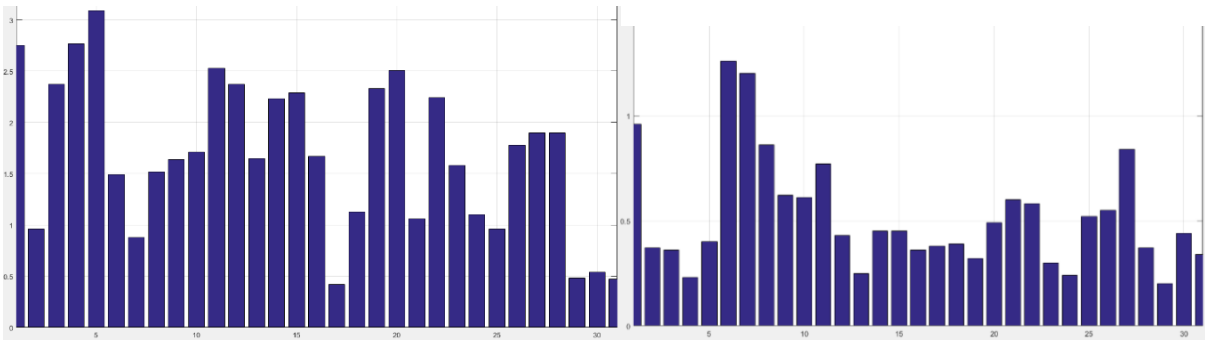
The analysis was carried out on the e□ample of the autonomous hydrometeorological station in Lyubech, which was implemented within the framework of the International project "THEOREMS-Dnipro" [1]. The load power of this system [2] is 102 W, taking into account the heating of the system in winter, and 19 W in its absence. According to the calculation, the energy consumed by the station per day is appro□imately 2.4 kV·h/day in winter and 0.5 kV·h/day in summer, respectively.

Today, a large number of low-power generators appear on the market. As a prototype for analysis used the parameters of the wind turbine EW 400W/12V [3]. It begins to generate electricity at a wind speed of 2.5 m/s.

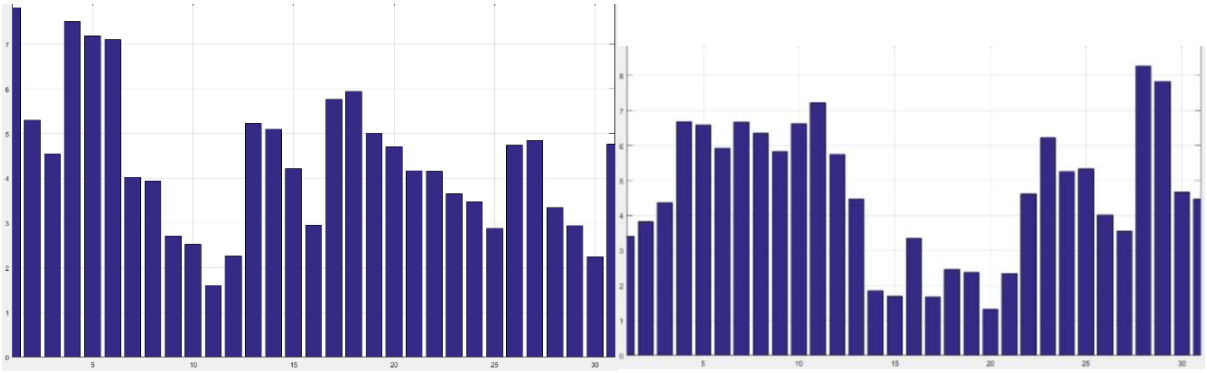
The indicators of solar radiation and wind speed for 2020 in December (when the lowest insolation) and October (when the insolation value is at an intermediate level) were analyzed using POWER Data Access Viewer [4].

Figure 1 shows that in October the sun's energy supply is not enough for only 3 days, but these days the average wind speed is more than 2.5 m / s, which can compensate for the lack of solar energy. Solar panels do not meet the load needs of the system for 19 days in December, but wind energy can compensate for the lack of 14 days. Therefore, it is still necessary to install rechargeable batteries for reliable power supply of autonomous monitoring stations. However, the capacity of batteries for combined power supplies can be chosen much smaller.

The research was also conducted for other months for the last 3 years. The results of these studies correlate with the data presented above and generally demonstrate the effectiveness of using wind turbines to compensate for insufficient solar activity during the year.



b)



d)

Figure 1 – Histograms of the distribution of insolation indicators for 2020:
a) in October, b) in December; wind speed indicators: c) in October, d) in December

References

1. Transboundary system of hydrometeorological and ecological monitoring of the Dnipro river. URL: https://theorems-dnipro.stu.cn.ua/ [in Ukrainian].
2. Prystupa A. L., Bezruchko V.M., Veligorsky O.A., Revko A.S. & Krishnyov Yu.V. (2019). Modern autonomous hydrometeorological measuring stations. O.V. Braginets (Ed.).Chernihiv: Chernihiv Polytechnic National University.
3. Wind turbine EW 400W / 12V (without charge controller). *AVANTE.* URL:https://avante.com.ua/ua/catalog/vetrogenerator_ew__400vt_12v_bez_kontrollera_zarjada-00916/ [in Ukrainian].
4. POWER Data Access Viewer. Prediction of Worldwide Energy Resource. URL: https://power.larc.nasa.gov/data-access-viewer/.

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ЕКОНОМІЧНІ АСПЕКТИ ВПРОВАДЖЕННЯ РЕСУРСОЗБЕРІГАЮЧИХ ТЕХНОЛОГІЙ В АПК

Внесок агропромислового комплексу у формування експорту України становить приблизно 45 % від загального розміру експорту товарів [1]. Проте постійна інтесифікація, гонитва за максимальними врожаями, порушення правил робіт агротехніки, використання