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SOLAR ENERGY IN AGRICULTURE

In connection with the rapid development of renewable energy sources on the territory of Ukraine, the increase in the number of suppliers, the change in the conditions for the provision of electricity services, the

question arises about the possibility of using solar energy for agriculture. Energy is one of the highest overhead costs in agriculture, especially for greenhouse and poultry farmers. Traditional energy sources, such as fossil fuels, harm the environment by affecting agriculture. Therefore, using solar energy for agriculture reduces costs and is good for the environment. In addition, reliance on fossil fuels is unsustainable as resources are depleted. Solar energy is a limitless resource [1; 3].

Even a preliminary analysis of the possibility of introducing alternative energy has two directions of development: the first is the use of energy by consumers for their own needs, the second is the power supply system of the farm and district consumers with simultaneous delivery of the produced electricity to the United Energy System. The most promising is solar energy, because this industry is the fastest growing. According to experts, the global market of solar batteries is growing by more than 30% annually.

From a technical point of view, the advantages of solar power plants are that there is no need to use fuel, no moving parts to wear out, and no maintenance time to keep the system running. A significant advantage is their modularity, which ensures quick installation in the places of operation, absence of operating noise and sources of harmful emissions.

In the regions of Ukraine and in the diffuse light conditions typical for our latitude, modules based on amorphous silicon have higher efficiency than modules based on mono- and polycrystalline silicon. This fact is confirmed by studies of leading foreign companies. However, the high cost of amorphous silicon modules makes them uncompetitive on the Ukrainian market. It is desirable to install them in an open area, where the sunlight is not blocked by trees and buildings. In addition, the optimal tilt angle and distance between the batteries should be determined for effective use. For example, for the Dnipropetrovsk region it is recommended to install photo modules at an angle of inclination of 45° to the horizon [2–4]. Solar-powered photoelectric water pumping systems are effective in most areas where there is no access to electricity. In addition, these systems provide water to remote pastures. Typically, simple PV systems are designed to operate when the sun is shining, providing water where it is needed. In these cases, solar panels are not needed because farmers store the water in tanks or pump it directly to the fields. Larger systems, however, may use track mounts, storage canals, and inverters. Farmers who install a large-scale PV system are maintenance-free because the power source is reliable. These systems are useful for irrigation, livestock watering, pond aeration, and more [2; 4].

Water and space heating is efficient for livestock and dairy enterprises and requires different areas and water heating. Modern farmers raise animals such as cattle and poultry in enclosed structures. Therefore, temperature and air quality control are vital for such buildings. To remove moisture, dust and toxic odors, the farmer needs to change the air regularly. In addition, heating such large rooms requires a significant amount of energy. The inclusion of a well-designed solar energy system can heat the air before it even enters the building. Such a system can also provide additional ventilation. In addition to space heating, solar energy is used in agriculture to heat water. A solar water heating system reduces farm costs. Mostly on dairy farms, where energy consumption is high up to 40% [2; 4].

REFERENCES

1. Афанасьев О. И. Е50 Электроаппаратное оборудование систем электропостачания энергоёмных производств [Текст] / О.И. Афанасьев, Л.Б.Жорняк, О.В.Немикина, В.М.Щусь; за заг. ред. П.Д.Андрієнко. – Запоріжжя: НУ Запорізька політехніка, 2023. – 432 с. – ISBN 978-617-529-425-3.
2. Оцінка вироблення електроенергії фотопанелями за умов різних типів кріплення масиву фотопанелей [Текст] [Електронний ресурс] / Електроенергетика, електромеханіка та технології в АПК : матеріали Міжнар. наук.-практ. конф., 9 листопада 2023 р. / Держ. біотехнологічний ун-т. – Харків, 2023. – С. 81-82.
3. Nemykina O. V. Renewable and alternative energy sources: Tutorial with parallel text. Renewable and alternative energy sources: Tutorial with parallel text [Text] [Electronic resource] / O.V.Nemykina, A.V.Blyzniakov. – Zaporizhzhia : Zaporizhzhia Polytechnic National University Publishing House, 2021. – 353 p. – Access Mode: <https://www.dynamicslr.com/solar-energy-applications-in-agricul/> (Date of access 15.03.24)