THE EFFICIENCY OF SOLAR PANELS DEPENDS ON CLIMATIC CONDITIONS

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Abstract: This article analyzes the scientific approaches needed to improve the efficiency of solar panels and discusses the factors that affect efficiency, ways to overcome them, and recommendations for designing optimal systems.

Keywords: Solar panel efficiency, Photovoltaic system, Electric energy,

Introduction

Nowadays, the sustainability of energy production and consumption is one of the global issues. In order to protect the environment and reduce dependence on traditional energy sources, the use of renewable energy sources is becoming widespread. Solar panels play an important role in this process, as they provide an environmentally friendly, energy-efficient and long-term source of energy.

In today's world, where energy issues and environmental protection are becoming increasingly important, solar energy is becoming one of the most important and sustainable sources for energy production. Solar panels, or photovoltaic (PV) panels, are a technology that directly converts sunlight into electricity, and their efficiency and profitability are key variables in energy production. The importance of solar energy in the global energy system and its impact on the environment are increasing interest in the development of this technology [1]. Currently, the issue of increasing the efficiency of solar panels is one of the most pressing problems in the field of science and technology, which constantly requires new materials, production technologies and design innovations.

The basic operating principles of solar panels, namely the photovoltaic

process, their different types - monocrystalline, polycrystalline and amorphous panels, and their technological characteristics, are widely discussed in this field. Efficiency, i.e. the share of energy extracted from sunlight, is increasing with technological advances. For example, the efficiency of monocrystalline panels can reach 20-23%, which expands their wide application possibilities [2-3].

However, there are still various problems in increasing the efficiency of solar panels, among which high prices, maintenance and installation costs, as well as resistance to weather conditions are important problems. Atmospheric pollution and variability of sunlight also cause a decrease in the efficiency of energy collection.

1 – Picture: Solar panel weather effects

The efficiency of solar panel installation depends on various factors, the correct consideration of which will allow to maximize energy production. The type of panel, geographical location, angle and installation method are the main factors affectting efficiency. In addition, weather conditions, the presence of shade and the quality of technological equipment also have a significant impact on the level of

energy production. The installation of solar panels is essential in modern energy systems, providing an environmentally friendly and renewable energy source [4-5].

Scientific research is being conducted, in particular, on the development of new materials and techniques, their resistance to heat and cold, as well as the development of energy harvesting and storage technologies. Large scientific centers and companies, such as Stanford University and SunPower, are distinguished by technological innovations.

Research in this area requires new approaches to increasing the efficiency of solar panels and ensuring their economic and environmental efficiency. To solve these problems, extensive research is being conducted on the manufacture of solar panels from multilayer and new materials, their resistance to heat and noise, as well as the development of energy harvesting and storage technologies. These processes not only serve to reduce the cost of energy production, but also to preserve the ecological environment and ensure energy independence [6-8].

In the future, solar panels equipped with new materials and technologies will be able to operate with high efficiency in any geographical conditions, and their widespread use will lead to significant changes in the energy sector. At the same time, research into improving the efficiency of solar panels is of great importance in the fields of energy, ecology and economics. The development of this field creates major opportunities for reducing the cost of energy production, protecting the environment and ensuring energy independence. In this process, technological innovations and scientific advances play a significant role, and through them, the role of solar energy in the global energy system will be strengthened in the future. Thus, research aimed at improving the efficiency of solar panels serves not only technological development, but also environmental and economic sustainability [9-13].

Conclusion

The adoption of solar energy systems has increased in recent years, as individuals and businesses seek sustainable and cost-effective solutions for their energy needs. At the heart of this growth is the pursuit of efficiency - the ability of solar panels to efficiently convert sunlight into useful electricity. Solar panel efficiency is a measure of how well a solar panel converts sunlight into usable electricity. It is calculated by dividing the electrical power produced by the amount of sunlight that falls on the panel. This percentage represents the efficiency of a solar panel in converting sunlight into electricity.

Most modern solar panels on the market today, whether for residential or commercial use, have efficiencies between 15% and 22%. As technology advances, we can expect efficiencies to increase, although most common panels for everyday use are likely to remain in this range for the foreseeable future.

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