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# Selection of Alternative Energy Sources for Power Supply Systems of Production Facilities

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**Abstract:** *The consumption of energy of various origins in the world is continuously increasing. Despite the emergence of energy-saving technologies, the potential for fossil fuels on earth is decreasing. With the existing rates and trends in the consumption of exploited, development and ongoing exploration of new deposits, various sources predict that oil reserves will last humanity for 35 ... 50 years, natural gas for 50 ... 70 years, coal for 150 ... 200 years, uranium for 60...80 years. At the same time, it should be taken into account that the use of fossil fuels causes almost irreparable damage to our environment, which increases proportionally or even accelerates with the growth of energy consumption. In this regard, the most serious experts suggest that without taking drastic measures, in 25–30 years, humanity is threatened by an ecological catastrophe, which will be superimposed by an energy catastrophe in another 10–20 years. Nuclear-fueled power plants, even without accidents, are also worries associated with the storage and disposal of waste.*

**Keywords:** *alternative energy sources, photovoltaic converters, solar panels.*

One of the ways to solve the problem under study is the most energetic use of alternative - the so-called "renewable" energy sources: solar energy, wind energy, hydropower, bioenergy, etc [1].

Solving the problem of alternative energy is urgent, since national security, the economic independence of the country, and the security of the population today and in the future directly depend on this. Unfortunately, most of these sources, being truly renewable, do not provide complete environmental safety. The socio-economic damage caused by giant lowland hydroelectric power plants is well known, the construction of which is all the less justified, given that their contribution to the overall energy balance is a few percent. To a large extent, tidal HPPs and HPPs based on powerful ocean currents are not environmentally “clean”, since their construction and operation violate the natural life balance of vast water areas. The ecological “purity” of bioenergetics is also at least very controversial [2]. Even such a seemingly “clean” type of energy as the use of wind energy is now facing sharp protests from environmentalists, since windmills cause great harm to birds and some other living beings.

Thus, solar energy is almost the only acceptable from the point of view of ecology. As already mentioned in the introduction to this dissertation, solar panels as sources of electricity for industrial facilities have a large number of advantages compared to other sources:

- despite their bulkiness and rather large weight, solar panels are more convenient to transport than windmills, mini hydro turbines, nuclear reactors and even generators powered by internal combustion engines (“engines”);
- solar panels are much more convenient to use than other sources of electricity; apart from the need to clean the solar panels from dust and dirt, they can be considered as maintenance-free units;

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Solar panels have an almost unlimited resource of functioning.

An important argument in favor of the development of solar power plants for energy supply systems of individual objects is that this direction is an essential component in the overall program for the development of solar energy, and this, according to not only the author of this dissertation, but also many of the most authoritative experts on energy problems, is one of the main lines of technological development in the 21st century. Many technical solutions that have been tested in relatively low-power power supply systems for production facilities (in particular, technical solutions that improve the efficiency and effectiveness of such systems) have good prospects for use in other areas of solar energy development, including in such areas that are decisive for the economy, as transport and energy of medium and large capacity [3,4].

Based on the brief analysis carried out, we will formulate the main scientific and practical direction of this article: research and development of components and devices for automated control systems for solar power plants for production facilities.

There are several technological directions in the development of solar energy, and these directions can be divided into 2 groups: direct use and accumulation of solar energy in the form of heat. We constantly come across the simplest implementation of this direction in garden plots, using hotbeds, greenhouses, “solar” showers, etc. In more complex and efficient installations, solar energy is accumulated during the day to heat rooms at night, with the help of this energy, sea water is desalted and food is cooked. In high-temperature installations, the sun's rays are concentrated on a small area, the temperature of which rises to 30000C, which makes it possible, for example, to melt metals [2].

Converting solar energy into some intermediate form of energy. For example, the direction of converting solar energy into biochemical energy is being developed in order to produce synthetic liquid fuel. For the purposes considered in this paper, practically the only way to use solar energy is its conversion into electrical energy using photoelectric converters.

Photoelectric generators are based on the photoelectric effect - the conversion of electromagnetic radiation energy into electricity. The essence of the photoelectric effect is that the electrons contained in any substance (solid, liquid or gaseous), under the influence of photons of incident radiation, acquire energy that allows them to change their energy state (for example, in semiconductors - to move from a filled valence band to band conduction, thereby creating an electric current). The density of the photoelectric current is proportional to the power of the absorbed radiation: $i=kF$, where $k$ is the coefficient of proportionality, depending on the properties of the material.

Photovoltaic converters for solar energy are commonly referred to as solar cells. The surface layer of photoelectric converters is made of n-type material with electronic conductivity, the inner layer is made of p-type material with hole conductivity. To drain electric current into an external circuit, a metal mesh (or comb) is applied to the illuminated surface of the semiconductor structure, which serves as a negative electrode, a solid metal plate is attached to the back side, which acts as a positive electrode. The outer surface of photoelectric converters has a protective coating of glass or quartz.

To obtain sufficient electrical power, photoelectric converters are placed on a flat surface and, by group connection, they form a panel of photoelectric converters, or a solar panel - fig. 1.1 a. In the vast majority of known solar panel designs, the solar cells are arranged in a single layer. More complex solar panel designs will be discussed next.

Although the search for optimal materials for photovoltaic converters is being intensively conducted all over the world, single-crystal silicon wafers with a purity of about 99.99% currently dominate [3].

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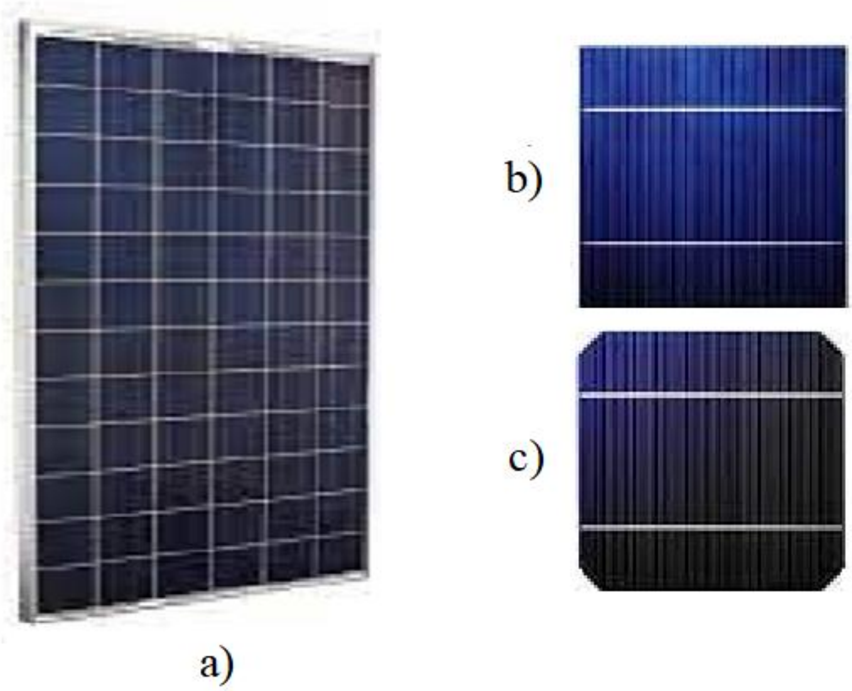

**Fig. 1.1.**

Silicon of such a "solar" frequency (several orders of magnitude worse than the silicon required for modern microcircuits and other products of the semiconductor industry) occurs in nature and can be used to manufacture photovoltaic converters with little or no additional purification. All photoelectric converters of this class currently produced abroad are plates with a thickness of several tenths of a millimeter and an area of 3,000 to 15,000 mm2. The shape of the plates in plan is determined by the fact that they are made of round "boules" of single-crystal silicon, and it can be, as shown in Fig. 1.1, square (rectangular) (Fig. 1.1b) or some intermediate (Fig. 1.1c), for example, square with cut corners (it is sometimes called "pseudo-square") (Fig. 1.1). The round shape is the most economical in terms of silicon "boule" consumption, but the effective area of the solar panel is 27% less [1].

**LITERATURE:**


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