

Solar Energy as A Source of Electric Energy

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Abstract. The article is devoted to the current problem of using solar energy as the main source of consumer power. The author gives a generalized description of the methods of converting solar energy into other types of energy. Also, state plans for the development of solar energy in various countries of the world were considered and favorable conditions for installing solar panels in the world were considered. The article reveals the problems of non-competitiveness of solar energy in relation to a given time and how this can be dealt with.

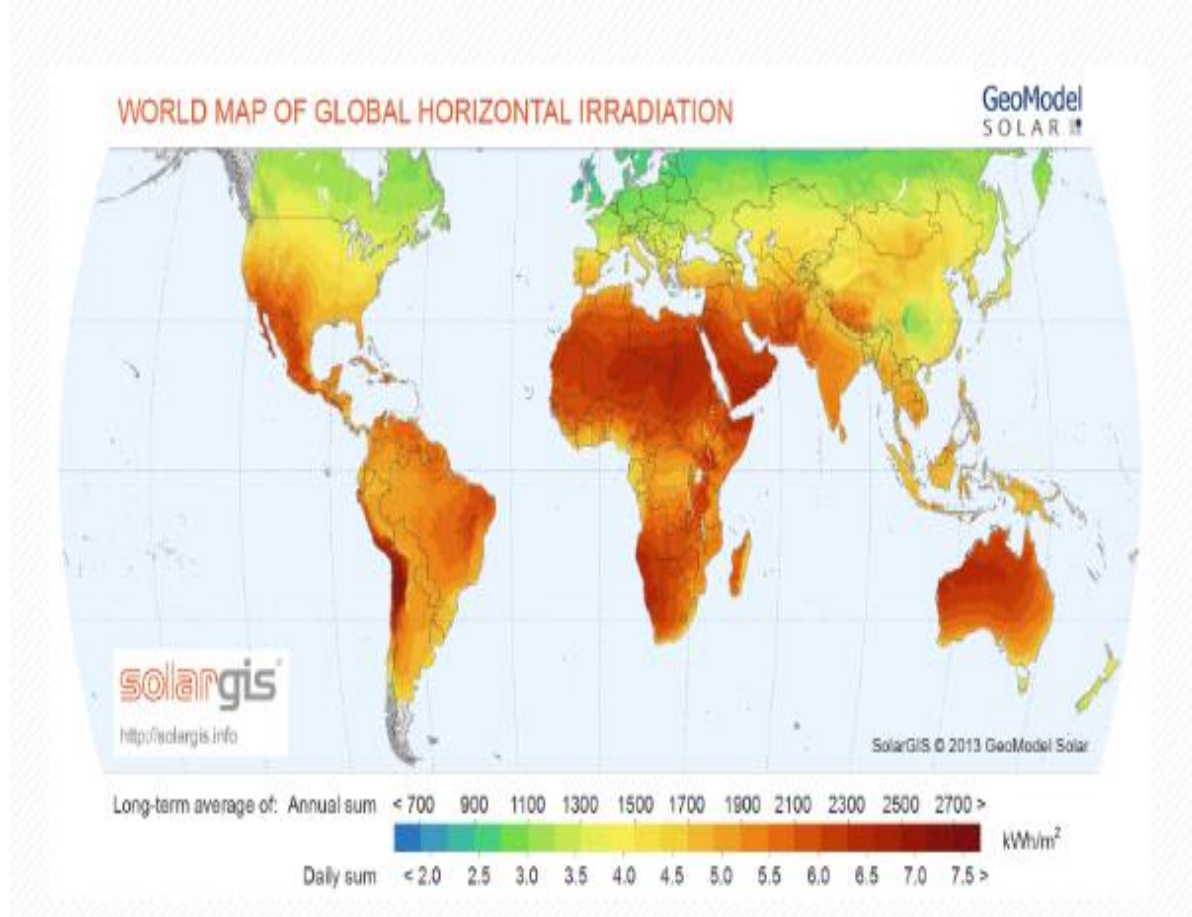
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Every year, residents rely more and more on technology, they cannot even imagine a day without them. At the same time, the development of technologies does not stand still, they become compact and very demanding on the quality of electrical energy. Consequently, electricity consumption has become greater, and will continue to grow each time. And because of the instability of the economy in the country, the prices for consumed energy are rising. For example, today in Russia there has been a jump in the cost of electricity consumed by the population. In addition to the annual "calendar" increase in its price by 10 - 15%, a fee for the electricity consumption of common house appliances (Internet providers, intercoms and cable networks, legal entities) has been added. If this continues, then soon the residents will pay for energy losses in quarterly transformers, in power lines, etc. And this applies to settlements and rural industries located far from big cities. [2]

The main possible solution to this problem is alternative energy sources. Namely, solar energy. Each country has a number of scientific councils that are responsible for the use of solar energy, such as the Scientific Council of the Russian Academy of Sciences on non-traditional renewable energy sources, the Committee on the use of renewable energy sources of the Russian Union of Scientific and Engineering Public Organizations, American Council On Renewable Energy: ACORE, The European Renewable Energy Council (EREC), etc.[5]

Each of these scientific councils establishes a plan for their state, which talks about increasing the share of solar energy in the overall energy system. So for Russia, the Ministry of Energy of the Russian Federation assigned a plan to raise the share of solar energy in the total energy system of the Russian Federation to 0.9% by 2020 (at the moment it is 0.001%).

To implement the plan, charitable conditions are needed so that the spent economic costs pay off in a short period of time. Looking at Figures 1 and 2, we can say that not every country will have efficient solar installations.[4]



Picture. 1- Distribution of total solar radiation in the world.

Currently, there are 2 most popular ways of converting solar energy: photovoltaics and solar thermal energy. The photovoltaic system is a unique way of generating electricity, by means of daylight hitting the panels. The principle of generating electricity is based on the photovoltaic effect. That is, when light penetrates the surface of the substance, the electrodes begin to move between the anode and cathode inside the panel.

As a rule, panels consist of several layers of semiconductor materials. The greater the concentration of light, the greater the generation of electricity. [1] This type of electricity generation is used in an autonomous power supply system based on solar panels.

An inverter is a device for converting the DC voltage of batteries into AC voltage 220V. The main disadvantage of the inverter is the limited battery life, which is determined by the capacity of the batteries and power consumption. The controller is a device that does not allow the batteries to be recharged or discharged prematurely. Accumulation blocks are used to accumulate the generated electricity. The main problem of all batteries is a small volume of capacity and not adaptability to large loads. One of the main reasons for not being competitive is the price. For example, to install an autonomous system in Russia, a private consumer will have to pay around 180 thousand rubles.

And the profitability and payback completely depends on sunny days a year at the installation site. This system is used for uninterrupted power supply of autonomous systems such as lighting, burglar alarms, etc. And also as the main source of energy (if the consumer is very far from the substation) or together with incoming power lines. [3]

Solar thermal energy is a system that allows the transformation of solar radiation into electrical or thermal energy using three technologies:

The first technology, one of the most common heat supply options, is the use of solar collectors. They are placed in a stationary state so that the heating is as efficient as possible. The most efficient coolant is air, water or antifreeze. The substance is heated by 45-50 °C above the ambient temperature. All this takes place in the collector. It can also be used for air conditioning, heat treatment of agricultural products and seawater desalination.

Such solar heating systems are very popular in Japan and the USA [6]. However, in countries such as Cyprus and Israel, there are many more such systems based on the population. Approximately 1 million collectors provide 70% of the country's population using this method of generating energy. India and China are trying to achieve such progress. Looking at Figure 2, Africa is an ideal candidate for such a system, but due to their economic situation, they are mainly used to run pumping units.[1]

The second technology converts solar energy into electrical energy using silicon-based solar cells. She found application in the space industry, namely in shipbuilding. The first mass application was in California. At present, a third of the photovoltaic cells market belong to Japan. In developed countries, it is already actively used, despite the factor that the technology is expensive.

The third technology is based on the transformation of solar radiation into electrical, using mirrors, to concentrate rays at one point. This method is used in solar power plants.[6]

Facts for switching to solar energy.

1. Unlimited fuel.
2. Silent, harmless power generation.
3. Autonomous power supply systems are safe and highly reliable.
4. Materials can be easily recycled and reused.
5. Easy equipment maintenance.
6. Use of electricity remotely in rural areas.
7. Modules can be part of the design of a building.
8. A rapid decrease in the energy payback time of the modules.
9. Increases the reliability of the country's energy supply.

On the basis of the conducted research, a conclusion can be drawn. In order for solar energy to be competitive, developments are needed to increase battery capacity and increase power and more research in terms of concentrating sunlight on solar panels in order to increase their efficiency and reduce the payback period. The rapid development of solar energy, using innovative world technologies, is the main competitor and in 2050 will be predominant in the market of energy-friendly technologies, which will provide all the needs of the population with electric energy by the end of the century.

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