

**PROSPECTS FOR THE USE OF SOLAR ENERGY, ADVANTAGES AND
DISADVANTAGES**

**ПЕРСПЕКТИВЫ ИСПОЛЬЗОВАНИЯ СОЛНЕЧНОЙ ЭНЕРГИИ,
ДОСТОИНСТВА И НЕДОСТАТКИ**

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Annotation: This article provides information on the current state of the use of solar energy and the prospects for the use of solar energy. The advantages and disadvantages of using solar energy have been carefully analyzed.

Keywords: energy consumers, solar energy, alternative sources, oil energy, thermal energy, solar power plants, energy sources, photovoltaic installations, photovoltaic converter, energy supply.

The modern world actively consumes energy, actually lives off it. While some countries are waging oil wars, others are investing in alternative sources, in particular in solar energy, the reserves of which are theoretically inexhaustible. It is not for nothing that many regions of the world are interested in photovoltaic cells, considering this scientific direction to be very promising. In the next two decades, the sun may become one of the main sources of energy. According to experts, over the past ten years, the European Union, producing solar radiation, began to consume it about 50 times more. Solar Power Europa, European Solar Energy Association, gives the following figures: in 2019, the growth of photovoltaic solar energy production in the world was 2.5 times higher than the use of coal and gas combined. The share of solar energy in global electricity production was about 2.6%. According to the association's forecast, by 2024 it is expected to increase the capacity of the world's solar power plants to 200 GW [1].

This sector is the largest sector of the global electric power industry in terms of annual investments and installed capacities. China has long been among the top ten countries in the world for the implementation of projects in the field of solar energy. The largest solar photovoltaic station was built in 2016 in Zhongwei, Ningxia Hui Autonomous Region. Its installed capacity is 1,547 MW. In 2020, the annual capacity of solar power plants in China was 28,330 MW. Japan (annual output of 23,409 MW), Italy (18,622), the USA (18,317 MW) are also considered the leading countries. [1].

«Despite the fact that the Sun is the main source of all energy on Earth, until now solar energy has not been used directly by mankind. Converting it into electrical and thermal energy was economically impractical due to the low efficiency of technologies and high cost.

The solar energy industry has developed in recent decades. Over 50 years, the cost of generating electricity in such devices has decreased by more than 1000 times. The more developed countries invest in the new route, the lower the price.

In Uzbekistan, attention to renewable energy sources, including the rational use of solar energy, is increasing every year. In particular, over the past three years, about ten resolutions have been adopted aimed at the development of this industry, and the law "On the use of renewable energy sources».

Increasing the number of solar power plants reduces the load on regional power grids and transformer stations, and the saved electricity provides reliable power supply to other consumers, reduces operating costs by reducing the load on transformer stations, reduces network losses, and most importantly, solar power plants reduce electricity costs several times, as well as save coal and natural gas.

In 2019, the Republic of Uzbekistan adopted the Law of the Republic of Uzbekistan on the use of renewable energy sources N: 21.05.2019 PRU-539. This law is supported by energy producers from renewable energy sources, manufacturers of renewable energy devices, as well as enterprises engaged in investment, research and development activities in the field of renewable energy sources:

In Uzbekistan, the annual output of solar energy per 1 m² is more than 1600 kWh. Considering that the efficiency of converting solar energy into electricity of modern photovoltaic installations (FES) is 15%, the maximum annual electricity production in Uzbekistan is one square meter photovoltaic converter (FEC) does not exceed 240 kW/h.[2].

In order to cover the load of 1 MW in daylight during the summer period, it will be necessary to create a solar power plant with an area of 5000 m² of photovoltaic panels in Uzbekistan. In Uzbekistan, with the cost of the FES of 5 US dollars, the capital funds amount to 5,000,000 US dollars. Despite the high cost of creating a device, advantages such as the absence of a fuel component, oxygen and carbon dioxide consumption make them very attractive to investors.

Prospects for increasing the share of solar energy in the total energy balance of the Republic of Uzbekistan. According to the Ministry of Energy of Uzbekistan, about 25 large solar power plants are planned to be built in Uzbekistan in the next 10 years. It is planned to launch the country's first solar power plant with a capacity of 100 MW in Navoi region. Construction work is scheduled to begin this year and be completed within two years. By 2030, it is planned to build another 25 such stations.

Solar photovoltaic power plants (SCPPS) are environmentally friendly, safe and economical power plants. The principle of operation is as follows: sunlight falls on the solar panel (photovoltaic converter), solar radiation is converted into direct voltage electrical energy (unusable) and accumulates in the battery, at the output the inverter converts constant voltage into alternating voltage electrical energy and is transmitted to the power grid (usual for us 220 V). Solar photovoltaic installations can be a full-fledged power source for facilities located far from power lines and an emergency reserve in case of frequent power outages. [2].

The scope of application of SCPPS is very wide, and their application depends on the area of solar panels. For example, there are portable power plants designed for use in the field of a separate pump or mobile phone. There are solid photovoltaic systems – industrial facilities that allow providing electricity to entire settlements or farms. This year, it is planned to produce 67.5 billion kWh of electricity in Uzbekistan, and in 2030 this figure will reach 120 billion kWh. According to experts, the total potential of solar energy in our country exceeds 51 billion tons of oil equivalent. For example, SkyWater Global (Cayman Islands) wants to invest \$1.3 billion in the construction of solar power plants in Uzbekistan

For example, SkyWater Global (Cayman Islands) wants to invest \$1.3 billion in the construction of solar power plants in Uzbekistan. Facilities are planned to be built in Tashkent, Samarkand, Navoi, Jizzakh, Surkhandarya and Kashkadarya regions. The energy company Masdar (PJSC Futureenergy Abu Dhabi), the French Total EREN and Pxanes Group (UAE, Dubai) are also showing interest in this direction. The German company Grass Energy has begun construction of a solar power plant in Monaco on the shore of the Aral gulf. Its capacity is 20 MW. The company plans to invest \$24 million in this project.

Despite all the favorable aspects of using solar energy as an energy source, this type of energy production has its positive and negative sides.

Positive aspects of the use of solar energy:

1. Possibility of recycling

Solar energy is a renewable energy source, unlike fossil fuels (non-renewable energy sources) such as coal, oil and gas, which, according to recent data, deplete the planet at a very low rate to provide energy to the entire population. [3].

2. Infinity

Absolute inexhaustibility, guaranteed by nature itself. Solar energy is inexhaustible. It will always be enough to meet the absolute needs of humanity and many of its generations.[3].

3. Amount of energy

The amount of energy coming to Earth from the Sun is about 1 billion terawatt-hours per year, and humanity produces about 20,000 terawatt-hours per year, or 0.002 percent of the solar energy reaching the Earth.

4. Noiselessness

The noiselessness of solar power systems is achieved due to the absence of moving parts in them. [4].

5. Breadth of the field of use

Solar energy can be used for specific areas of any country where there is no centralized power supply. Solar energy can be used as a heating element and auxiliary equipment to increase the production of fresh water in remote areas of Egypt, and, of course, it is one of the main sources of energy for the International Space Station (ISS) and satellites, since Solar radiation in space is much higher in strength than on the surface of the earth. [5].

6. Economic efficiency in use

By using solar panels as an alternative energy source, owners of buildings and private homes will receive significant savings. The decisive factor in the service sector is very low maintenance costs. To maintain solar panels, they need to be cleaned several times a year, and the manufacturer's warranty starts from 10 years. [6].

7. The ability to use everywhere

Solar energy falls on all places where the sun shines, that is, absolutely on all parts of our planet, both at the equator and at northern latitudes, which allows you to receive and use solar energy everywhere.

8. Environmental friendliness

Relatively high environmental cleanliness. Ecology is one of the most pressing problems of the modern world. Humanity is struggling with the environmental problem with all its might, but the use of non-renewable fuels leads to large-scale environmental pollution, a lot of waste accumulates in vast territories, which already has a negative impact on nature and human health. Solar energy is the most environmentally friendly energy, since when installing solar panels and all related equipment, practically no harmful substances are emitted into the environment. [8].

9. Advanced technology

Solar energy does not stand still. Every year there are new developments in the field of higher-quality materials that increase the efficiency of solar panels, allowing solar panels to take up less space and produce more energy. Modern developments in

the field of solar panel production technology will allow to increase efficiency up to 50% in the near future.[8].

Disadvantages of using solar energy:

1. High cost

High cost is a common reason for not buying solar panels, because they require a large initial investment, and people cannot afford it. But in many developing countries, the government helps its citizens buy and install solar power plants by providing them with loans and helping them fill out all the necessary documents.

2. Environmental pollution

As we mentioned earlier, solar energy is the most environmentally friendly energy we have ever seen. But in order to get it, it is necessary to produce solar panels, greenhouse gases and chemical compounds that are dangerous to the environment and people are emitted into the atmosphere during the production of panels.

3. Getting low power per square meter

One of the most important parameters of electrical energy is the amount of energy in the average power density, measured in Watts/ m^2 , per square meter (m^2) per unit area. For solar energy, this indicator averages 170 W/ m^2 , which is higher than for all renewable energy sources, but compared to traditional energy sources (oil, coal, gas, nuclear energy) this value is quite low. This leads to an increase in the area of solar panels to generate 1 kW of energy.

4. Discontinuity of the use of the solar system

Since the sun does not shine at night, the amount of energy generated on cloudy days is significantly reduced, which makes solar energy unable in many cases to be the main source of electricity. But even taking these factors into account, solar energy remains a more stable form of energy than, for example, more widespread wind energy. [6].

5. Energy saving problems

Rechargeable batteries are needed in industry for energy storage and periodic smoothing of uneven energy from solar panels. Their main drawback is the price, because high capacity batteries are very expensive, and not everyone can afford them at such a price. A partial solution to this problem is the collection and subsequent use of peak energy generated by solar panels during daylight hours using rechargeable batteries.

6. Elements used

For the manufacture of solar panels, rare earth materials are required, which increases their cost and makes them very difficult to manufacture and process. As a result, this leads to a significant increase in the cost of solar panels.



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