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SOLAR ENERGY USE, SOLAR ENERGY - DEVELOPMENT HISTORY, PROS AND CONS

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The fashion for alternative energy is gaining momentum. Moreover, the focus is on renewable energy sources - tides, wind, sun. Solar energy (or photovoltaics) is considered one of the fastest growing industrial sectors. Quite often very optimistic statements like the fact that all the energy of the coming times will, no less, be based on solar energy. Strictly speaking, the energy of a star called the Sun is present in a "conserved" form in all types of fossil fuels - coal, oil, gas. This energy began to accumulate at the stage of growth of plants that consume sunlight and heat, which, due to complex biological processes, turned into carbon fossils. The energy of water, its circulation is also supported by the Sun.The density of solar energy at the upper boundary of the atmosphere is 1350 W / m2, it is called the "solar constant". When the sun's rays pass through the Earth's atmosphere, some of the radiation is scattered. But even at the very surface of the Earth, its density is sufficient for possible use, even in cloudy weather.

History of development

The photovoltaic effect (i.e., the appearance of a stationary current in a homogeneous material with its homogeneous photoexcitation) was discovered in 1839 by the French physicist Alexandre-Edmond Bekverell. A little later, the Englishman Willoughby Smith and the German Heinrich-Rudolf Hertz independently discovered the photoconductivity of selenium and ultraviolet photoconductivity. In 1888, the first "solar radiation recovery device" was patented in America. The first achievements of Russian scientists in the field of photoconductivity date back to 1938. Then, in the laboratory of academician Abram Ioffe, for the first time, an element for converting solar energy was created, which was planned to be used in solar energy.

The development of ground-based solar energy was preceded by a lot of work by scientists (including the Leningrad-Petersburg scientific school - physicists Boris Kolomiets and Yuri Maslakovts) in the field of solar batteries for space purposes. At the Leningrad Physics and Technology Institute, they created tallium sulfur cells, the efficiency of which was 1% - a real record for that time.

Abram Ioffe also became the author of the now popular decision to install photocells on roofs (although at first the idea did not take root widely only because

no one experienced a shortage of fossil fuels at that time). Today, countries such as Germany, the United States, Japan, Israel are increasingly installing solar panels on the roofs of buildings, thus creating "energy-efficient houses."

Solar energy began to generate more interest in the second half of the 20th century. Thanks to practical developments in this area, thermal power plants were created, where the coolant was heated by direct solar radiation, and a turbo-electric generator drove the steam generated in the boiler. With the accumulation of knowledge and progress from theory to practice, the question of the profitability of solar generation arose. Initially, the tasks of solar energy did not extend beyond the power supply of local objects, for example, hard-to-reach or remote from the central power system. Back in 1975, the total power of all solar installations on the planet was only 300 kW, and the cost of a peak kilowatt of power reached 20 thousand dollars. But, of course, for the start of solar energy - even without taking into account the economic component - significantly greater efficiency was required. And they managed to achieve it to some extent. The efficiency of modern silicon semiconductor generators is already 15-24% (see - Efficiency of solar cells and modules), due to which (as well as their fall in price) there is a steady demand today. The production of solar panels has been mastered by large world companies such as Siemens, Kyocera, Solarex, BP Solar, Shell and others. The cost of one watt of installed electrical power on semiconductor solar cells dropped to $ 2.

Advantages:

The strengths of solar energy are obvious to everyone and do not need extensive explanations. First, the resources of the Sun will last for a long time - the duration of the existence of a star is estimated by scientists at about 5 billion years. Secondly, the use of solar energy does not threaten greenhouse gas emissions, global warming and general environmental pollution, i.e. does not affect the ecological balance of the planet. A photovoltaic station with a capacity of 1 MW produces about 2 million kWh per year. This prevents the emission of carbon dioxide in comparison with a fuel power plant in the following volumes: about 11 thousand tons on gas, 1.1-1.5 thousand tons on oil products, 1.7-2.3 thousand tons on coal.

Minuses:

The bottlenecks of solar energy include, firstly, still insufficiently high efficiency, and secondly, insufficiently low cost per kilowatt-hour - something that raises questions in connection with the widespread use of any renewable energy source. Added to this is the fact that a fair amount of solar radiation at the Earth's surface is scattered uncontrollably. Environmental safety is also, strictly speaking, questionable - after all, it is not yet clear what to do with the disposal of used elements. And, finally, the degree of study of solar energy - no matter what they say - is still far from perfect. The weakest link in solar energy is the low efficiency of the batteries; the solution to this problem is only a matter of time.

Yes, getting energy from the Sun is not the cheapest project. But, firstly, over the past thirty years, one watt, produced by means of photocells, has fallen in price dozens of times. And secondly, the desire of European countries to reduce dependence on traditional energy sources plays into the hands of solar energy.

Also, don't forget about the Kyoto Protocol. Now we can say that solar energy is developing at a steady pace both from the point of view of science and from the point of view of commerce. Today solar energy is most actively used for three purposes: heating and hot water supply and air conditioning;
conversion into electrical energy using solar photovoltaic converters;
large-scale production of electricity based on the thermal cycle.

Solar energy does not have to be converted into electrical energy, but it is quite possible to use it as heat. For example, for heating and hot water supply of residential and industrial facilities. The basis of the principle of operation of the design of solar heating systems is the heating of antifreeze. Then the heat is transferred to storage tanks, usually located in the basement, and consumed from there. One of the largest potential consumers of photovoltaic energy is the agricultural sector, which is independently capable of consuming hundreds of megawatts of peak PV energy per year. To this can be added navigation support, power supply for telecommunication systems, systems for the health resort and tourism business, as well as cottages, street solar lights, etc.

Today, the possibility of absolutely fantastic, from the point of view of the layman, ways of using solar energy is being seriously considered. For example, projects for orbiting solar stations or, even more fantastic, solar power plants on the Moon. And there really are such projects. In space, the concentration of solar energy is much higher compared to our blue planet. The transmission of energy to the Earth is possible with the help of directed light (laser) or microwave (microwave) radiation. When atomic energy was harnessed by man, it seemed that now that fossil fuel would definitely be supplanted as the main energy resource, but this, alas, did not happen. Even the most optimistic forecasts suggest that if the rates of oil and gas production simply remained at the current level, this fuel would only last for several decades. There will be enough coal for another couple of centuries, but in the end, this path definitely leads to a dead end. And what will people have to do when there is simply no fuel left in the bowels of the earth, but the demand for energy will also continue to grow?

Fortunately, the most important source of energy in the life of our planet - the Sun - is located 150 million kilometers from the Earth. The sun is constantly undergoing thermonuclear reactions, which, in terms of their energy intensity, surpass any modern nuclear reactor. We owe this energy to the very origin of life, oxygen was released into the atmosphere, gas and oil acquired chemical energy, and significant reserves of helium-3 were formed on the Moon.

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