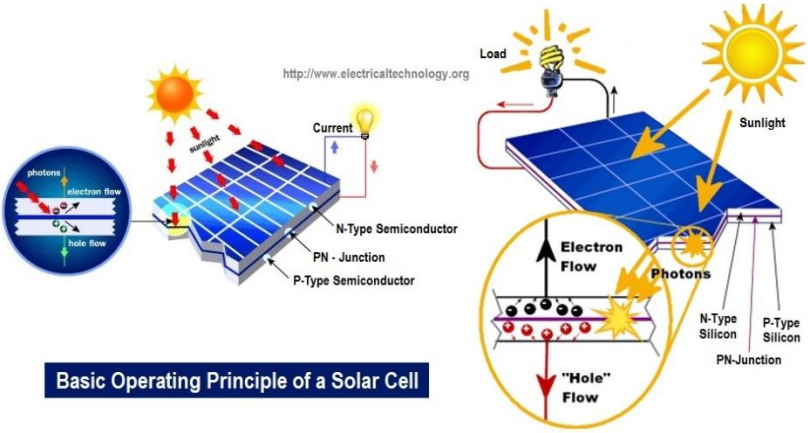
УДК 621.311.243

Martynovich A., Zharkova D., Levitskaya M.
Solar Panels

Belarusian National Technical University
Minsk, Belarus

Deep in the center of the sun, intense nuclear activity generates huge amounts of radiation. In turn, this radiation generates light energy called photons. These photons have no physical mass of their own but carry huge amounts of energy and momentum. On their journey from the sun to earth, photons can collide with and be deflected by other particles and are destroyed on contact with anything that can absorb radiation, generating heat and energy. [1,49]
The solar panel consists of several photovoltaic modules combined into one device using electrical conductors.



Basic Operating Principle of a Solar Cell

The device is designed to directly convert the rays of the sun into electricity. It is called the photoelectric effect. Semiconductors are used for the manufacture of elements, possess positive and negative charged electrons and consist of two layers: n-layer (-) and p-layer (+). The remaining electrons knock out of the layers and occupy empty spaces in another layer under the influence of sunlight. So, free electrons move constantly, passing from one plate to another with generating electricity, which accumulates in the battery. Initially, solar cells were made of silicon, but the process of cleaning silicon is laborious and costly. Solar panels are being developed with alternative solar cells from cadmium, copper, gallium and indium compounds.

There a lot of advantages of using solar panels.

1. Where there is no other source of electrical power available, or where the cost of installing conventional electrical power is too high;

2. Where other sources of electrical power are not reliable. For example, when power cuts are an issue and a solar system can act as a cost-effective contingency

3. When a solar electric system is the most convenient and safest option. For example, installing low voltage solar lighting in a garden or providing courtesy lighting in a remote location

4. You can become entirely self-sufficient with your own electrical power

5. Once installed, solar power provides virtually free power without damaging the environment [1].

The Republic of Belarus with its own natural reserves provides about 15-18% of its needs in fuel and energy resources. The missing amount of fuel and energy is supplied from Russia and other countries, for which 1.7–2.0 billion US dollars are spent annually. Therefore, the issue of finding our

own environmentally friendly energy sources is extremely urgent for us [2].

Now solar energy in Belarus is in trend. In the past few years, the country has increased solar energy production by 70 times, from 0.4 million MWh in 2013 to 28 million MWh in 2016, not including solar power plants owned by private companies. This energy is enough to supply a small Belarusian town throughout the year.

The Belarusian construction company Belzarubezhstroy CJSC began construction in 2019 in the Cherikovsky district of the Mogilev region, the largest 109 MW photovoltaic station in Belarus. The solar energy park will be modules placed on a special subsystem that collect solar energy. A plot of 220 hectares has been allocated for the photoelectric power station. The resulting energy will be supplied to the energy system of Belarus. The construction of the station is aimed at the development of environmentally friendly solar energy in Belarus, diversification of energy sources, reduction of operating and transportation costs in connection with the provision of electricity to nearby settlements.

References:

1. Boxwell, Mr Michael Solar Electricity // Handbook-2012 Edition. – Greenstream Publishing, 2013. – P.200.

2. Солнечная энергетика: состояние и перспективы использования в Беларуси [Electronic resource]. – Mode of access:https://energobelarus.by/articles/alternativnaya_energetika/solnechnayaa_energetika_sostoyanie_i_perspectivy_ee_ispolsovaniya_v_respublike_belarus. – Date of access: 26.04.2020.