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## Improving the Protection Area Through Heliotechnics

**Davronov Farhodjon Shuxrat o'g'li**

Teacher-methodologist of the educational methodological situational center, University of Public Security of the Republic of Uzbekistan, Tashkent, Uzbekistan, e-mail: farhoddavronov98@gmail.com

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**Abstract:** *This article discusses the improvement of security equipment, which is the basis of the activities of all organizations operating in the field of security, through the introduction of the use of solar technology to eliminate power outages and deficiencies.*

**Keywords:** *Security, solar technology, solar cells, solar module, charge level regulator, batteries, inverter, single crystal, polycrystalline, thin strip.*

In the modern world, man cannot imagine his life without the use of electricity. In addition to the standard methods of obtaining electricity, there are alternative methods. Using solar panels in the country, you can provide constant lighting, power any household electrical appliances, some types of garden equipment and more. The energy obtained is absolutely free and practically uninterrupted. Devices that convert solar energy into other types of energy are called heliotechnical devices, and the field that deals with the prospects of using solar energy is called heliotechnics.

Heliotechnics (Greek "Gelios" means "Sun") is a field of technology that converts sunlight into another type of energy that is easier to use in practice. The science of how to use solar energy for technical purposes. The sun's rays reaching the earth's surface are a great source of heat. The main task of solar technology is to find effective ways to use this source, to create various devices, energy sources. In areas where the sun shines for 1,800 to 3,000 hours a year, the use of solar panels and solar power plants saves a lot of fuel and energy.

The use of solar technology in the field of security can solve many problems related to electricity, such as power outages, long-distance power supply and other similar problems. Due to the loss of electricity at the protected facility, security alarms, video surveillance cameras, fire alarms will not work, and there are many cases of disorder, theft or fire. In order to prevent such cases, it is necessary to use solar technology (solar panels). The principle of operation of solar panels is to convert the alternative and absolutely free rays of the sun during the day into electricity and charge the battery. Provides a constant supply of electricity using batteries during periods of sunlight.

There are several types of solar panels available. To choose the right solar panel, you need to know how it works, because many users (without special knowledge) believe that solar panels are some kind of element that can store solar energy. In fact, converting sunlight that falls on the surface of a battery into electricity is a very complex process. The solar module is a crystal (silicon or gallium) plate that converts

the energy of a stream of light into an electric current due to its physical and chemical properties and processes. Electricity from the solar module flows through the wires to the accumulator and feeds it. The total charge of the battery is determined by the controller. In operating mode, current flows from the battery to the inverter and from there to electrical equipment and lighting. Charging is already complete and the inverter is not yet turned on (e.g. people are asleep or gone to visit) There is also a standby mode in the process.

#### **The main elements of a solar cell:**

- Solar module. Depending on the version, it produces a voltage of 6-40 volts. At home, modules are typically used for 12 or 18 volts, rarely 24 or more.
- The charge level regulator (controller) is required to wait for the device from charging mode or to switch it to working mode in a timely manner. Adherence to these modes can significantly increase battery life.
- Batteries are a storage element capable of storing energy from solar modules for some time.
- An inverter is a device that converts direct current into alternating current, which is necessary to power many household electrical appliances.

In addition to solar automation, a set of system elements that convert a home's electrical system from solar power to a traditional (city) power grid when faults occur and vice versa. All elements of the "solar" network (in this case) go into standby mode.

#### **Only three types of silicone solar cells are used in daily life:**

1. Monocrystals.
2. Polycrystalline.
3. Thin tape (amorphous silicon).

Monocrystalline solar panels are angled black monocrystalline panels. The efficiency for such products is 15-25%. The best performance is achieved when the plates are turned towards the Sun. On cloudy days, morning and evening, when solar energy falls on the panel less, energy production decreases. Adjustments are made to direct the space in the direction of sunlight to improve operational performance.

You can recognize polycrystalline type modules by the dark blue color of the surface. The efficiency reaches 12-15%. Accordingly, a large surface area is required to obtain a power comparable to single-crystal models, but the cost of the products is lower. The principle of operation allows polycrystalline panels to work on a cloudy day.

Thin-band modules are cheaper for amorphous solar systems than previous types. They are produced in the form of a flexible blue film protected by a special transparent coating. The efficiency of the products reaches only 6%. They are less durable - the resource of the silicon layer is quickly developed, but they work successfully in areas with high cloud cover, even converting scattered light into electricity. In protected objects, it is best and easiest to install solar panels on the roof of the object. This is the largest area, but there are a few rules:

1. The solar panel is installed in a place where the rays shine at an angle of 90 ° for most of the day.
2. When installing a solar panel, for best results (maximum efficiency) in summer it is preferable that the panels are located 40-45 degrees to the horizon with a southerly direction.

**The main advantages of solar panels:**

1. Infinity and existence anywhere in the world. One way or another, the sun shines everywhere. In this regard, only the amount of radiation is taken into account, depending on the location and time of the year in which the power plant is planned to be used. The electricity generated depends directly on the number of sunny days and their duration, as well as the angle of the sun on the horizon.
2. Environmental friendliness. Electricity is generated without switching on energy carriers. Deep recycling of used batteries and other components does not lead to environmental pollution.
3. Solar panels are environmentally friendly, electricity generation is not accompanied by noise (like windmills);
4. The service life of the plant components is designed for the full life of the plant - an average of 25 years. After that, the efficiency of the batteries decreases.
5. The solar energy industry continues to grow rapidly and the price of components is falling sharply, no one can say what their price will be in 25 years, but of course much lower than today.
6. Exceptions from electricity suppliers. The house is not cut off from electricity.
7. Once the equipment covers its costs, the electricity will be free.
8. The modular principle of building the system allows it to be expanded without re-equipment.
9. Separation from prices for other energy sources (gasoline, diesel, gas), they are not used in the use of solar panels.

**The advantages of solar systems are somewhat reduced by their disadvantages:**

1. The initial investment is that it is best to use this definition when purchasing equipment. The payment period depends directly on the intensity of use of the system and the parameters of solar radiation at the installation site.
2. Relatively low panel efficiency. On average, one square meter of elements produces 120W per hour, if calculated from the level of solar energy - it is only 10-15%. However, manufacturers regularly announce the growth of this figure through the use of new technologies.
3. Depending on the weather. The highest efficiency is obtained on a sunny, cloudless day. You can calculate the number of active hours of the sun using special tables for each protected object.

4. It is difficult to use a solar station to power energy-intensive devices - welding, perforators, and heaters.
5. The structure of the system is not limited to the presence of panels. You need a battery to run at night. Its power should be enough to turn on the LED street light, providing lighting the house. You will need to purchase a high quality charger for the battery to work properly. An inverter is needed to convert 12, 24 V DC voltage to 220 V sinusoidal stabilized voltage.

### **Deep cycle batteries**

The electricity generated by solar panels is stored in batteries. For efficient operation of the system, it is best to use special deep-cycle batteries that do not require special maintenance, are sealed, and are safe to install inside the facility. For a small facility with minimal power consumption, at least 3-4 batteries, each with a capacity of 100-120 Ah, are required. They are reliable, durable and can withstand many charging cycles.

### **Battery charge controller**

A controller is installed between the solar panels that generate electricity and the batteries that store this energy. Supervisors vary in terms of specifications and price. This is the most important control element of a solar mini power plant: the controller protects the batteries from complete discharge and overcharging, which is very dangerous for them. If the battery has an unacceptably low discharge, the controller shuts off the load. When the batteries are fully charged, the controller prevents energy from flowing from the solar panels to the batteries.

### **Invertor**

Solar panels generate 12V DC, and most electrical protection devices operate at 220V. Therefore, an inverter is included in the solar mini power station system, which converts 12V direct current to 220V AC. It is better to use more expensive inverters that produce pure sine wave ("pure sine") current. Cheaper inverters that generate modified sine wave current may not be suitable for some equipment.

### **Installation of solar panels: choice of location, installation and placement rules**

In recent years, alternative, renewable energy sources are gaining more and more popularity, among which solar energy stands apart. This source of energy is good because it is inexhaustible for at least another 5 billion years.

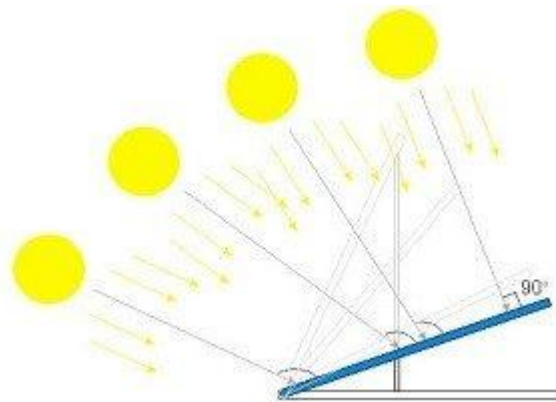


**Where to install**



To maximize the use of the characteristics of solar panels, some features of their location on the surface should be taken into account:

1. **Shadow.** The most important thing in choosing an installation site is shading. If the battery is placed in the shade of other buildings or trees, it will not generate enough energy to function normally. In addition, as a result of improper installation, it will fail in a short time, not having time to justify the purchase cost.
2. **Orientation.** It is necessary to direct the battery towards the Sun, so that the maximum flow of sunlight falls on the photocells of the battery. For those who did not learn geography well at school, it should be recalled: the Sun moves (if I may say so) along the equator, so if you are in the northern hemisphere, orient the front side of the battery to the south. If you are in the southern hemisphere, head north.
3. **Incline.** This aspect, like the previous one, depends on the geographical location. Professionals recommend setting the angle of inclination equal to the latitude in which it is located. In addition, if you are not on the equator, the angle must be corrected depending on the season and it is 12 degrees based on its increase in summer and decrease in winter.



### **Assemble yourself or with the help of specialists**

The choice is entirely yours! If you have working hands and “have a head on your shoulders”, you can safely proceed with self-assembly of the solar battery.

But before that, study the literature on self-installation of solar panels, choose the right place based on the above features, stock up on the necessary tools and feel free to proceed with the installation.

The advantages of self-installation are unconditional - saving money and gaining invaluable experience, which may come in handy in the future. But there are also disadvantages - you will lose your time, and in case of incorrect installation and, therefore, low battery efficiency, only you will be to blame.

If you turn to qualified specialists, you will receive a quality service, and, in case of malfunction, you can turn to them in order to eliminate the error.

You will not spend your time on this, but you will incur material losses. Therefore, weigh all the pros and cons on your own before making the final choice of installation option.

### **Fastening steps**

Before determining the stages of installation work, first you need to decide where you are going to mount the solar panels: on the roof of your house or on special farms.

If you stop at the first option, then there are two stages:

Installation of profiles on the roof;

Fastening of panels by means of bolts with a diameter of 6-8 mm to profiles.

Profiles and panels must be firmly fixed and be in a stationary state. When choosing this type of fastening, you will save space on your site, and the roof will also acquire an attractive, aesthetic appearance.

If you decide to install solar panels on special ground farms, then you should follow these steps:

1. Farm purchase. Most often, these are iron or aluminum corners and profiles, usually delivered unassembled, so it becomes necessary to assemble them.
2. Preparation of the necessary tools and materials. You will need 6-8mm bolts and wrenches depending on the size of the bolts you purchased.
3. Farm collection. After completing the first two steps, you can begin to assemble a metal truss on which solar panels will be placed. This process will not take you much time and effort, everything is quite simple, no more difficult than assembling a designer.
4. Choice of location. Based on the tips above, choose the most suitable place and firmly fix the structure in the place provided for this.
5. Installation of solar panels. The final step is to attach the panels to the truss. Fix the solar panels to the truss using the prepared bolts so that they do not move even in strong wind gusts.

Expert tip: to make better use of the available space, it is recommended to combine the types of arrangement of solar panels. Fix the panels on the roof of the house and on special ground farms.

### **Installation nuances**

With any of the selected types of installation, it is necessary to monitor the angle of inclination. In the case of a prefabricated truss, you can set any degree of inclination, as well as the orientation to north or south.

With a rooftop installation, these regulatory functions disappear, and you will not have to rebuild the roof to meet the desired angle of inclination.

Be sure to take into account the moment of shading the batteries with each other. If on the roof you put them on the same plane, then on the farms some use several levels.

In this case, the distance necessary to avoid shading should be taken into account. This distance is 1.7 times the height of the truss.

The result of the work done will be the fact that you have a solar battery on your site, depending on the material and area of which, you can receive different amounts of electricity.

By doing the installation yourself for the first time at your place, in the future you can offer this service to others, and with the fact that sales of solar panels are currently growing, this can put an extra “penny” in your pocket.

**Conclusion:** He noted that the use of solar panels in security systems has many advantages, as well as many problems with electricity through the use of solar panels in the field of security. we considered the difficulty of reaching the power supply and the possibility of finding solutions to other similar problems. In order to prevent the failure of alarm systems, video surveillance cameras, fire alarms and other incidents of disorder, theft or fire due to loss of electricity in the protected object heliotechnics (solar panels) should be used.

**REFERENCES:**

1. “Гелиотехника в школе” П.Л.Михайлов Textbook for universities, Tashkent, 1977.
2. “Solar Concentrating Modules With Louvered Heliostats: Emerging Research and Opportunities” Strebkov, Dmitry, Filippchenkova, Natalya, Irodionov, Anatoly IGI Global, 30 oct. 2020y
3. “Использование солнечной энергии” Р. Р. Апариси, Б. А. Гарф. Moscow, 1958 год.
4. “Исследование и разработка стационарных составных параболоцилиндрических концентраторов для фотоэлектрических и тепловых преобразователей солнечной энергии.” Литвинов П 15.04.08
5. <http://www.booksite.ru>
6. <http://www.wikipedia.org>
7. <https://teplo.guru/eko/ustanovka-solnechnyih-batarey.html>