COMPARISON OF MONOCRYSTALLINE AND POLYCRYSTALLINE SOLAR CELLS

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Which solar cell is better - monocrystalline or polycrystalline? To answer this question, you first need to understand the difference between them.

The first thing that catches your eye is the appearance. In monocrystalline elements, the corners are rounded and the surface is uniform. Rounded corners are associated with the fact that in the production of monocrystalline silicon, cylindrical billets are produced. The homogeneity of the color and structure of single-crystal elements is due to the fact that this is one grown crystal of silicon, and the crystal structure is homogeneous.

In turn, polycrystalline elements have a square shape due to the fact that rectangular billets are used. The heterogeneity of the color and structure of polycrystalline elements is due to the fact that they consist of a large number of heterogeneous silicon crystals, and also include a small amount of impurities.

The second and probably the main difference is the efficiency of the conversion of solar energy. Monocrystalline elements and, panels based on them have today the highest efficiency - up to 22% among the commercially available and up to 38% in the space industry. Monocrystalline silicon is produced from high purity raw materials (99.999%).

The commercially available polycrystalline elements have an efficiency of up to 18%. The lower efficiency is due to the fact that in the production of polycrystalline silicon is used not only primary silicon of high purity, but also secondary raw materials (for example, recycled solar panels or silicon waste from the metallurgical industry). This leads to the appearance of various defects in polycrystalline elements, such as crystal boundaries, microdefects, carbon and oxygen impurities.

The third difference is the price of a solar battery. Naturally, the price of a battery made of single-crystal elements is slightly higher per unit of power. This is because of the more expensive manufacturing process and the use of high purity silicon. However, this difference is insignificant and is about 10%.

As can be seen from this list, for a solar power plant it does not matter which solar panel will be used in its composition. The main parameters - the voltage and power of the solar panel do not depend on the type of elements used and it is often possible to find panels of both types of the same power. So the final choice is for the customer. And if it does not confuse the heterogeneous color of the elements and a little larger area, then probably he will choose cheaper polycrystalline solar panels. If these parameters are of important to him, then the obvious choice is a slightly more expensive single-crystal solar panel.

In conclusion, I would like to note that according to the EPIA European Association in 2010, the production of solar batteries by type of silicon used in them was distributed as follows:

1. polycrystalline - 52.9%
2. monocrystalline - 33.2%
3. amorphous and the like - 13.9%

So polycrystalline solar panels in terms of production occupy a leading position in the world.

INTELLECTUAL POWER SYSTEM WITH ACTIVE-ADAPTIVE NETWORK

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The power grid complex in the Russian Federation mainly develops by traditional principles today. The power grid complex should go to innovative way of development, otherwise, in the future it will not be able to meet the necessary requirements. It is a prerequisite for the formation of the concept of Intellectual power system with active-adaptive network (IPS AAN). Its creation is linked with the development of the following technologies:

- Flexible Alternative Current Transmission Systems (FACTS)
- Overhead line and DC link based on modern converter devices with microprocessor control
- Wide Area Measurement Systems (WAMS) - checking the parameters of the electric network mode online, with using modern technical equipment of processing and transmitting information.
- High-speed communication
- Microprocessor technology for information processing and equipment control

For the IPS AAN with the necessary properties, in the near future requires the development of innovative technology platform, which includes the following main directions:

- modern equipment with improved economic and environmental characteristics
- automatic control systems in pre-emergency and normal modes
- possibility of connection with new automatic systems, which using renewable, recycled and alternative energy sources
- New information resources and technologies to assess situation and take quick and correct decisions
- Competent scientific, design and educational foundations
- These directions are based on the following technologies:
- Fault current limiters (switching, superconducting, or semiconducting)
- The energy storage devices of different types and applications
- Devices based on high-temperature superconductivity
- Self-diagnosis system of equipment "on-line" mode