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INCREASING EFFICIENCY POWER SUPPLY OF FARM ENTERPRISES SYSTEM USING SOLAR POWER PLANTS

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Abstract: *The article describes the equipment of the solar power plant, the factors affecting the efficiency of its operation and materials for the manufacture of solar modules.*

Keywords: *solar power plant, efficiency, solar modules.*

The constant growth requirements of the world population occurs leads to an increase in electricity demand and to the search for new sources of energy. One of such renewable sources is the Sun, the energy of which must be correctly transformed [1].

Solar power currently represents a small percentage of global power generation, installations of solar photovoltaic (PV) power plants are growing rapidly for both utility-scale, agricultural, industrial and distributed power generation applications.

Before we talk about the efficiency of solar power plants, consider basic arrangement of solar PV power plant. Figure 1 [2] gives an overview of a megawatt-scale grid connected solar PV power plant. The main components include:

1) Solar modules

These convert solar radiation directly into electricity through the photovoltaic effect in a silent and clean process that requires no moving parts. The PV effect is a semiconductor effect where by solar radiation falling onto the semiconductor PV cells generates electron movement. The output from a solar PV cell is DC electricity. A PV power plant contains many cells connected together in modules and many modules connected together in strings to produce the required DC power output[2].

2) Inverter

These are required to convert the DC electricity to alternating current (AC) for connection to the utility grid. Many modules in series strings and parallel strings are connected to the inverters.

3) Step-up transformers

The output from the inverters generally requires a further step-up in voltage to reach the AC grid voltage level. The step-up transformer takes the output from the inverters to the required grid voltage (for example 10kV, 20kV, 35kV, or llOkV, depending on the grid connection point and country standards).

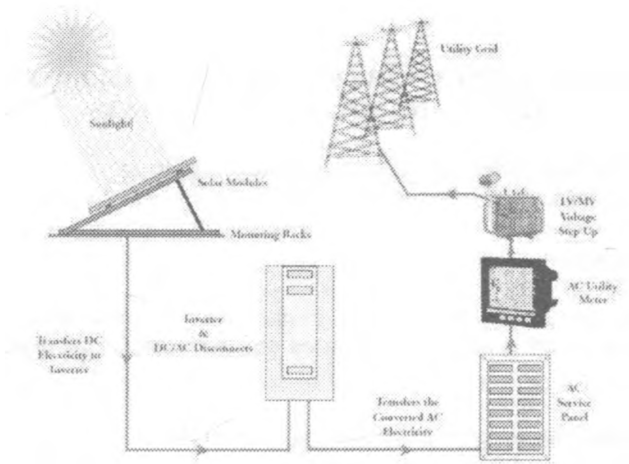

Figure 1 **Overview of Solar PV Power Plant**

The efficiency of the described system is influenced by many factors, here are some of them:

- **Frequency of solar modules**

The number of solar modules depends on the amount of recycled solar radiation, but the increase in the number of modules will lead to an increase in the area of their location, but as a rule the area is limited

- **Fixed tilt angle**

Fixed tilt angle depends on the location of the station, so we can not affect the performance of the solar panels by changing fixed tilt angle of the already built station. Of course there are systems for tracking the position of the sun, but they are expensive.

- **Solar flux level**

The amount of incoming solar radiation a person can't affect in principle. From the solar radiation can depend on the location of the power plant, but if we then increase the cost of energy transmission.

- **Materials of solar modules**

Thus, the most optimal way to learn about the efficiency of the station is to select the material from which the solar module is produced.

Let's take a closer look at the materials from which solar modules are made.

PV cells may be based on either silicon wafers (manufactured by cutting wafers from a solid ingot block of silicon) or "thin-film" technologies for which a thin layer of a semiconductor material is deposited on low-cost substrates. PV cells can further be characterised according to the long-range structure of the semiconductor material, "mono-crystalline," "multi-crystalline" (also known as "poly-crystalline") or less-ordered «amorphous" material [2].

Figure 2 [2] shows the most commonly used PV materials:

Crystalline Silicon (c-Si): Modules are made from cells of either mono-crystalline or multi-crystalline silicon.
Mono-c-Si cells are generally the most efficient, but are also more costly than multi-c-Si.

• **Thin-film:** Modules are made with a thin-film deposition of a semiconductor onto a substrate. This class includes semiconductors made from:

• Amorphous Silicon (a-Si).
• Cadmium Telluride (CdTe).
• Copper Indium Selenide (CIS).
• Copper Indium (Gallium) Di-Selenide (CIGS/CIS).

• **Heterojunction with intrinsic thin-film layer (HIT):** Modules are composed of a mono-thin c-Si wafer surrounded by ultra-thin a-Si layers.

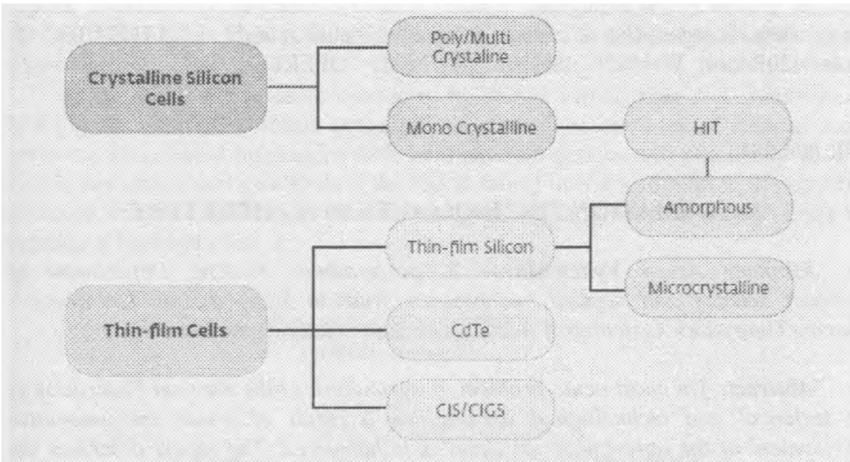

Figure 2 **PV[7] Materials**

From an economic point of view, the choice of material should be based on the "price-quality" principle. In this regard, to improve the efficiency of solar power plants, it is advisable to use Cadmium Telluride (CdTe).

CdTe is a compound of cadmium and tellurium. The cell consists of a semiconductor film stack deposited on transparent conducting oxide-coated glass. A continuous manufacturing process using large area substrates can be used. Modules based on CdTe produce a high energy output across a wide range of climatic conditions with good low light response and temperature response coefficients. CdTe modules are well established in the industry and have a good track record [2].

We live in a world of the future, although this is not noticeable in all regions. Often people barbarously take raw materials and energy from nature, violating the natural balance. We need to take something, nature gives us generously itself - the energy of the Sun. At the moment about 1% of the electricity on Earth [1] is obtained from the processing of solar radiation. But already today we can say with certainty that solar energy is capable in the near future to become a full-fledged alternative to the traditional methods of generating electricity'.

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