

# POSSIBILITIES OF USING SOLAR ENERGY

Roman Jakubčák, Stanislav Kušnír, Matúš Katin

## ABSTRACT

*This paper deals with renewable sources of energy. This paper offers information about energy from Sun that is used widely around the world. The Sun is the most powerful source of energy, and therefore we development new technologies that are able use this clear energy.*

## 1. INTRODUCTION

Today, renewable energy sources are very hot topic. Many nations count on coal, oil and natural gas to supply most of their energy needs, but reliance on fossil fuels presents a big problem. Fossil fuels are a finite resource. Eventually, the world will run out of fossil fuels, or it will become too expensive to retrieve those that remain. Fossil fuels also cause air, water and soil pollution, and produce greenhouse gases that contribute to global warming. Renewable energy resources, such as wind, solar and hydropower, offer clean alternatives to fossil fuels. They produce little or no pollution or greenhouse gases, and they will never run out [1].

## 2. RENEWABLE ENERGY

Renewable energy is energy which comes from natural resources. Among these sources of energy belongs also solar energy.

Solar energy is energy comes from most powerful source of energy. The energy is generated by the sun. This energy comes in the form of electromagnetic radiation in waves of various lengths. There are a variety of technologies that have been developed to take advantage of solar energy:

- Photovoltaic systems
- Solar hot water
- Solar electricity

**Photovoltaic systems** – Solar cells convert sunlight directly into electricity. They are made of semiconducting. When sunlight is absorbed by these materials, the solar energy knocks electrons loose from their atoms, allowing the electrons to flow through the material to produce electricity. This process is called the photovoltaic effect. Solar cells are typically combined into modules that hold about 40 cells. Several connected photovoltaic arrays can provide enough power for a household; for large electric utility or industrial applications, hundreds of arrays can be interconnected to form a single, large photovoltaic system.

The performance of a solar cell is measured in terms of its efficiency at turning sunlight into electricity. Only sunlight of certain energies will work efficiently to create electricity, and much of it is reflected or absorbed by the material that makes up the cell. Because of this, a typical commercial solar cell has an efficiency of 15%-about one-sixth of the sunlight striking the cell generates electricity. Low efficiencies mean that larger arrays are needed, and that means higher cost [2].



Figure 1 – Solar cell

**Solar hot water** – Sun we can use for heat water and used this water in buildings and swimming pools. Solar collector is mounted on the roof. He consists of a thin, flat, rectangular box with a transparent cover that faces the sun. Small tubes run through the box and carry the fluid (in this case water). The tubes are attached to an absorber plate. Plate is painted black to absorb heat. This heat heats the fluid passing through the tubes. The storage tank then holds the hot water.

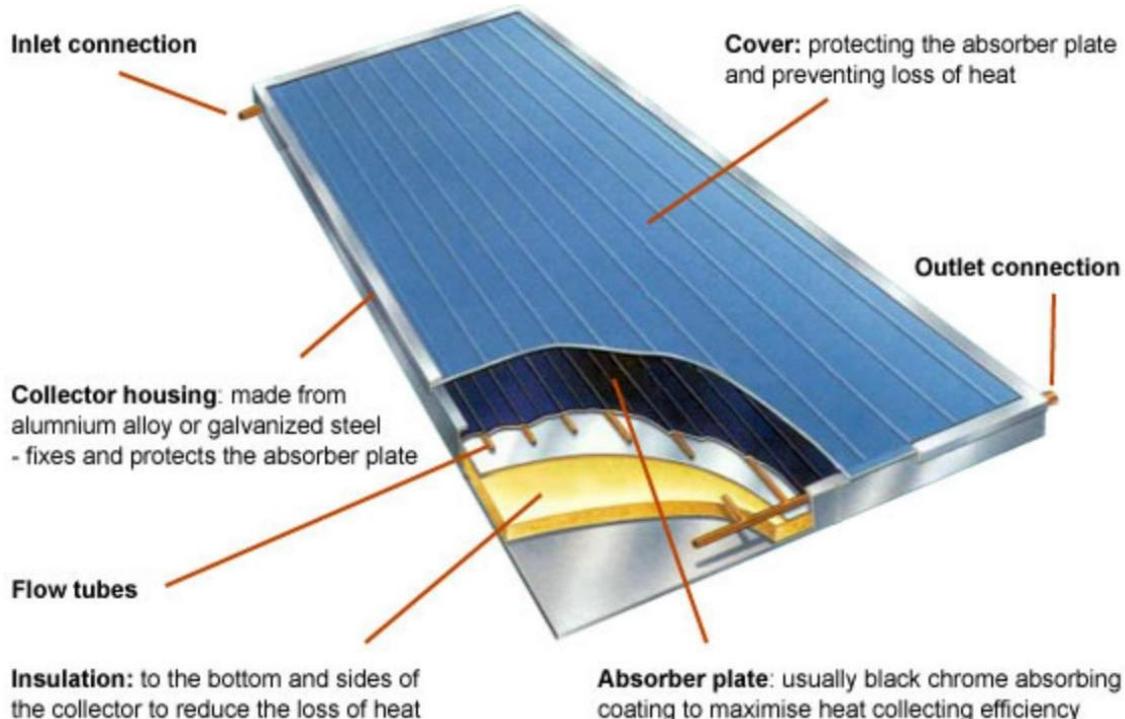


Figure 2 – Flat plate collector [3]

**Solar electricity** – Today we are using fossil fuels as a heat source. A new generation of power plants, with concentrating solar power systems, uses the sun as a heat source. We know three types of concentrating solar power systems:

- Parabolic trough – This system concentrates the sun's energy through long rectangular mirrors. The mirrors are U-shaped. The mirrors are tilted toward the sun, focusing sunlight on a pipe that runs down the center of the trough. This heats the oil flowing through the pipe. The hot oil then is used to boil water in a conventional steam generator to produce electricity.
- Dish/engine system – System uses a mirrored dish. The dish-shaped surface collects and concentrates the sun's heat onto a receiver, which absorbs the heat and transfers it to fluid

within the engine. Fluid expands against a piston or turbine and produce mechanical power. Mechanical power is converting in generator to electricity [2].

- A power tower system - uses a large field of mirrors to concentrate sunlight onto the top of a tower, where a receiver sits. This heats molten salt flowing through the receiver. Then, the salt's heat is used to generate electricity through a conventional steam generator. Molten salt retains heat efficiently, so it can be stored for days before being converted into electricity. That means electricity can be produced on cloudy days or even several hours after sunset [2].



Figure 3 – Solar power tower

**Passive solar heating and daylighting** – Many building are designated to use of passive solar heating and daylighting. Buildings designed for passive solar heating usually have large, south-facing windows because the south side of building always receive the most sunlight. Materials that absorb and store the sun's heat can be built into the sunlit floors and walls. The floors and walls will then slowly release heat at night, when the heat is needed most. Many of the passive solar heating design features also provide daylighting. This is simply way how use natural sunlight to brighten up a building's interior.

**Solar process space heating and cooling** – Commercial and industrial buildings may use the same solar technologies as residential buildings, but they can also use solar energy technologies that would be impractical for a home. Many large buildings need ventilated air to maintain indoor air quality. In cold climates, heating this air can use large amounts of energy. A solar ventilation system can preheat the air, saving both energy and money. This type of system typically uses a transpired collector, which consists of a thin, black metal panel mounted on a south-facing wall to absorb the sun's heat. Air passes through the many small holes in the panel. A space behind the perforated wall allows the air streams from the holes to mix together. The heated air is then sucked out from the top of the space into the ventilation system [2].

### 3. CONCLUSIONS

Today a topic renewable energy source is actual and discussed. We need find new sources of energy, because fossil fuels are finite resources. Energy from Sun has big potential, and we can use this type of energy not only for produce electricity, but also to produce hot water, space heating and cooling. In this way we contribute to reducing the emission and cutting-down environmental pollution.

### REFERENCES

- [1] *Larry West*: Top 7 renewable energy sources. Retrieved from:  
[http://environment.about.com/od/renewableenergy/tp/renew\\_energy.htm](http://environment.about.com/od/renewableenergy/tp/renew_energy.htm)
- [2] *Types of Solar Energy*: Retrieved from:  
<http://www.renewableenergyworld.com/rea/tech/solar-energy>
- [3] *Solar hot water collectors*. Retrieved from:  
<http://www.greenspec.co.uk/solar-collectors.php>

### Authors:

Ing. Roman Jakubčák  
Technical University in Košice  
Department of Electrical Power Engineering  
Mäsiarská 74, 041 20 Košice, Slovak Republic  
E-mail: [roman.jakubcak@tuke.sk](mailto:roman.jakubcak@tuke.sk)  
Tel.: +421 55 602 3566

Ing. Stanislav Kušnír  
Technical University in Košice  
Department of Electrical Power Engineering  
Mäsiarská 74, 041 20 Košice, Slovak Republic  
E-mail: [stanislav.kusnir@tuke.sk](mailto:stanislav.kusnir@tuke.sk)  
Tel.: +421 55 602 3566

Ing. Matúš Katin  
Technical University in Košice  
Department of Electrical Power Engineering  
Mäsiarská 74, 041 20 Košice, Slovak Republic  
E-mail: [matus.katin@tuke.sk](mailto:matus.katin@tuke.sk)  
Tel.: +421 55 602 3566