EssaysMasters.com

Solar energy: methods of utilization

/Name of the author/

/Institutional affiliation/

ABSTRACT:

The Sun is a central star of the G-type main-sequence in the Solar system. It maintains the life on the Earth. The organic world of the planet exists due to the Sun. It is the only source of the natural light and warmth, as well as the initial source for other energy types, such as water, the wind, naphtha, and coal. Nowadays, the problem of supplying the world increase in energy demand is central to the sustainable development. The solar energy, being a renewable and free, has been inspiring the scientists to design new projects. Thus, the subject of the essay is the active systems of solar energy transformation into warmth and electricity. The objectives of the work are to explain the notion of the sun energy, to describe the passive and active utilization of the solar energy, and to outline the positive and negative features of the solar energy utilization.

INTRODUCTION

The Sun is an inexhaustible source of energy. Solar energy is the kinetic energy of radiation and light which are formed in the result of the internal thermonuclear reactions. The nuclei of certain elements have such a big attraction power that they lose their repulsive charges and form a new nuclear which has lesser mass than the previous nuclei. This difference produces the energy [9].

Humanity has been using solar energy from the beginning of its times. Indeed, the biorhythms respond to the solar day. Moreover, people arrange domestic work and living conditions to have more benefits from it. The polymaths of the active use of solar energy are Georges-Louis Buffon, who designed a huge concave curved mirror that focuses rays in one dot [4], Horace Benedict de Saussure, who made first water heat collector [7], and Augustin Mouchot with his first solar-powered engine, which transferred solar energy into a mechanical power [3]. Modern sustainable tendency, which can become one of the friendliest to the environment, to transform the energy of the Sun into any other convenient type of energy is called solar power. It belongs to the renewable type of energy, so it is economically justified. The urgency of the issue can be resolved by the projects focused on the Sun as the main or the only source of energy for plants, cars, houses, and entire cities. One of the most prominent examples is Masdar City planned in Abu Dhabi, UAE [6].

Sun energy can be utilized via two types of systems: passive and active.

I. THE PASSIVE USE OF SOLAR ENERGY

The passive systems do not have any electrical or mechanical appliances. The passive solar buildings are designed to decrease or exclude the use of electricity, heating, ventilation, and other necessary systems. It is possible with the respect to the local climate conditions. Passive building technologies and materials include isolation, massive floors, special systems of the warmth holding (for example water containers in the walls), the south-facing windows and slots, and near-house planting, as illustrated in Fig.1. Thus, passive construction and design perform the role of alternative solar collector, which provides warmth in winter time, substitutes cooling systems in summer, and serves as ventilation all year round [8].

II. THE ACTIVE USE OF SOLAR ENERGY

The active systems are represented by solar thermal energy and photovoltaic which are the study objects of solar power.

Solar collectors are widely used for gathering the solar energy which they absorb and transform into energy. Thus, the energy of the Sun transmitted into warmth can be accessible practically in all the processes. For example, Israel and Cyprus are the world leaders in heating the water with the Sun for the domestic means [2]. The USA uses the collectors mostly for heating the water in swimming pools [10]. Moreover, solar collectors can provide heat. During this process, the radiation is converted to the warmth of water or any other liquid coolant. Warm coolant gives

the heat with a steam engine [8].

Electricity can depend on photovoltaic and concentrated solar power. In the first case, amperage is received out of the solar energy with the help of photoemission. During this process, the electrons are beaten out of metals. It means that the connections of electrons and nuclei of metal atoms are broken by the influence of electromagnetic waves (X-rays, light, or gamma rays). On contrary, the concentrated solar appears due to the lenses and mirrors as the mediums for catching and concentrating the light from a huge area into one slim ray. Another medium of this kind is a special mechanism to trace the Sun's position [5].

Active solar systems might be less industrial as well. For example, solar cookers are effective for pasteurization and drying, but the obvious shortcoming lies in the necessity to catch the direct rays of the Sun by shifting the position of the cooker [1]. Water treatment systems make water potable. However, solar water disinfection is only possible when the sunlight is harmful to the microorganisms which live in water. For example, when water temperature is 30°C (86°F) and the level of sunlight radiation in 500 W/m^2m^2, it takes six hours to achieve the effect [10]. Another way of water treatment is desalination. This process might be either direct or indirect. The direct one includes evaporation through special condensation traps, where salt and other elements are stored, cooling the vapor, and collecting the drinking water. Indirect ways apply various systems of desalination with collectors, which work on the sun energy [8]. Thus, water treatment processes can solve the problems with drinking water in distant regions and worldwide.

III. THE POSITIVE AND NEGATIVE ASPECTS OF THE SOLAR ENERGY UTILIZATION

Taking into consideration all the facts, it is obvious that the active processes of receiving the solar energy have been established not long ago. Undoubtedly, the development in the field can contribute immensely to the usage of renewable energy in both domestic life and industry.

The future of the solar energy use depends on several undeniable advantages. First, solar energy is renewable comparing to the minerals which will soon be exhausted. Moreover, it is more stable and requires fewer recourses. Obviously, it does not harm the environment. It does not produce any greenhouse fumes, soil corrosion, or water pollution. Besides, the Sun is completely free and available for everyone. If a person decides to install the collector, he or she will need only to buy it once. Furthermore, this investment will be smart since people can stop wasting money on heating the water. The batteries can be exploited during one's lifetime. The solar collectors can be more practical and convenient than the central heating systems or electricity, especially in remote regions.

Despite numerous advantages, the comprehensive study on solar energy should continue. Unfortunately, the technologies are expensive and uncommon. In order to bring them to the mass market and to increase the costs of fossil fuels, it is important to reduce the price of the equipment and inform people about the importance of renewable resources. One of the biggest drawbacks is that it is hard to control the production of solar energy. Its amount depends on the climate, weather, geographical position, and the part of the day. However, further research

can reduce the drawbacks and improve the usage of solar energy.

IV. SUMMARY AND CONCLUSIONS

The Sun is considered to be the most powerful source of energy in the Solar system. Without its warmth and light, any life form would be impossible. The internal thermonuclear reactions provide the planets with the energy. Solar energy is kinetic because of its radiation and light.

There are two ways to use solar energy: passive and active. Passive excludes any electrical or mechanical appliances. Passive systems include the houses built with the materials and designed in the most favorable way to receive as much solar energy as possible and to reduce the usage of electricity, heating, cooling, and ventilation. The active systems are represented by various batteries, collectors, and photoelectric systems which are responsible for the warmth and electricity. As the result, people can heat the water, cook, and process heat with the Sun.

The projects of the utilization of solar energy are developing. The positive aspects relate the increasing popularity of renewable energy. Obviously, it is free and demands zero resources. Everyone can understand easily how to set, exploit, and maintain the systems. Finally, it is friendly to the environment. The negative sides include expensive cost and rareness, as well as the impossibility of receiving the energy at night or in the cold regions of the Earth. However, solar energy utilization remains to be a goal of sustainable development in the industry, agriculture, and domestic life.

can reduce the drawbacks and improve the usage of solar energy.

IV. SUMMARY AND CONCLUSIONS

The Sun is considered to be the most powerful source of energy in the Solar system. Without its warmth and light, any life form would be impossible. The internal thermonuclear reactions provide the planets with the energy. Solar energy is kinetic because of its radiation and light.

There are two ways to use solar energy: passive and active. Passive excludes any electrical or mechanical appliances. Passive systems include the houses built with the materials and designed in the most favorable way to receive as much solar energy as possible and to reduce the usage of electricity, heating, cooling, and ventilation. The active systems are represented by various batteries, collectors, and photoelectric systems which are responsible for the warmth and electricity. As the result, people can heat the water, cook, and process heat with the Sun.

The projects of the utilization of solar energy are developing. The positive aspects relate the increasing popularity of renewable energy. Obviously, it is free and demands zero resources. Everyone can understand easily how to set, exploit, and maintain the systems. Finally, it is friendly to the environment. The negative sides include expensive cost and rareness, as well as the impossibility of receiving the energy at night or in the cold regions of the Earth. However, solar energy utilization remains to be a goal of sustainable development in the industry, agriculture, and domestic life.

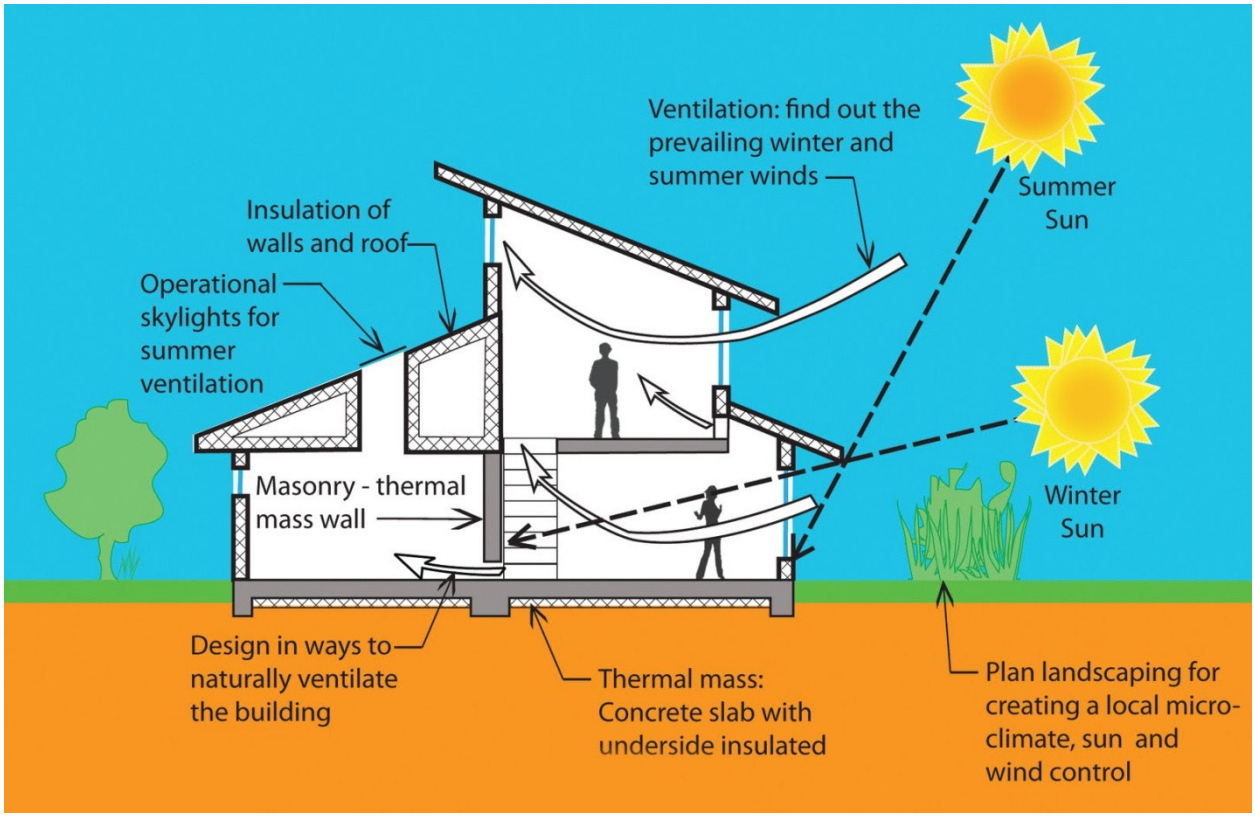
Ventilation: find out the prevailing winter and summer winds
Summer Sun
Insulation of walls and roof
Operational skylights for summer ventilation
Masonry - thermal mass wall
Winter Sun
Design in ways to naturally ventilate the building
Thermal mass: Concrete slab with underside insulated
Plan landscaping for creating a local micro-climate, sun and wind control

Figure 1