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# Environmental Consequences of Solar Energy Development and Other Sources of Energy

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**Abstract**
In recent years, scientists are increasingly raising the question of the huge impact of solar energy on the ecology of our world. This study attempts to unveil the relationship between the development of solar energy and the threat of growth of environmental problems. Thus, the stream of solar energy simply has to be taken under the control of people and used as much as possible, but with the preservation of the unique earth's climate. At the moment, it is no secret that carbon resources are being depleted very rapidly, and if the search for alternative sources of energy in the near future will not succeed, then the prospects for our civilization are absolutely small. So, among the possible successors that are able to pick up the baton of traditional energy, the most attractive among alternative energy sources is solar energy, which is considered environmentally friendly.
**Keywords**: Solar energy, energy, ecology, ecological problems, climate, environment.

## 1.0 INTRODUCTION

Energy in the modern world is the basis for the development of fundamental industries that determine the overall progress of production. In all industrialized countries the rate of energy development outpaced the development of other industries [4]. The main factor in the development of civilization today is the direct use of various energy sources. Every living thing requires some form of energy to survive. Solar energy is the main source of energy in our planet because it has been coming to our Land for billions of years and, accordingly, all processes on earth have long been accustomed to it.

The use of energy is an important condition for the existence of mankind. Energy available for consumption has always been necessary to meet many human needs, improve conditions and increase life expectancy.

At the same time, energy is one of the centers of adverse effects on humans and the environment. It affects the atmosphere (emissions of gases, consumption of oxygen, moisture, and particulate matter), the hydrosphere (creation of artificial reservoirs, water consumption, discharges of heated and polluted water, liquid waste), the lithosphere (landscape change, consumption of fossil fuels, emissions of toxic substances).

## 2.0 Literature Review

### 2.1 Harnessing Solar Energy

Solar energy is a form of alternative energy, which is based on the direct application of solar radiation in order to obtain energy. Solar energy is renewable energy, it is "environmentally friendly", and does not produce waste in the process of use. The production of energy by solar power plants is perfectly combined with the concept of distributed energy production.

In the process of production of solar cells, the amount of pollution does not exceed the permissible level for the production of microelectronic industry. Solar cells have a specified service life, which is 30-50 years. The use of cadmium in the production of some types of solar cells in order to improve the conversion efficiency forms a complex issue of their utilization and disposal, which has no acceptable solution from an environmental point of view, although such elements are not widely spread, and in recent production, cadmium compounds have already found a worthy alternative [7].

In modern times, the production of thin-film solar cells, which contain only 1% of silicon relative to the mass of the substrate, where thin films are applied, has been intensively developed. Due to the low consumption of materials on the absorbing layer, thin-film silicon solar cells are cheaper to produce, but still have an irreparable degradation of characteristics and lower efficiency over time. It is also common to produce thin-film solar cells on other semiconductor materials, such as Smig, a serious competitor to silicon. So, in 2005, the Shell Corporation decided to concentrate the production of thin-film elements, and sold the business on manufacture of non-thin-film (monocrystalline) silicon photovoltaic cells [7].

### 2.2 Impact on Society

Taking into account the noted factors of the negative impact of energy on the environment, the increase in energy

 

consumption did not cause much concern to the public. This continued until the 1970s, when experts announced numerous data indicating significant anthropogenic pressure on the climate, which poses a threat of disaster with uncontrolled increase in energy consumption. Since that time, no other problem has attracted so much attention as the problem of present and future climate change.

It is generally believed that one of the main reasons for this change was energy. Energetics refers to any area of human activity related to the consumption and production of energy. A significant part of the energy resources provides energy released by burning fossil fuels (coal, gas and oil), which leads to the release of a huge amount of substances into the atmosphere.

Such a simplified approach does real damage to the economy around the world and can deal particularly severe blow to the economy of the countries that have not reached the required level for the end of the industrial stage of development of the level of energy use. Russia is one of these States. In this case, in fact, the situation is more complicated. In addition to the greenhouse effect, the problem of which is largely based on energy, the climate of our planet is influenced by many natural causes, which include in particular solar activity, the parameters of the earth's orbit, volcanic activity, self-oscillations in the "atmosphere and ocean". The correct analysis of the problem can only be in account of the whole complex factors, of course, it is necessary to clarify the question of how to respond to the world's energy consumption in the future. Mankind should be able to establish self-restraint in the use of energy in order to avoid global warming [1].

Most of the electricity is produced is from thermal power plants. Next are hydroelectric power plants and nuclear power plants. In most countries, the share of electricity generated by thermal power plants is more than 50 %. Fuel oil, gas, coal, shale are usually used as fuel at thermal power plants. Fossil fuels can be classified as non-renewable. In accordance with experts' estimates, coal on the planet can last only 100-300 years old, natural gas at 40-120 years, oil 50-80 years [12].

In parallel with fuel, thermal power plant uses a significant amount of water. Coefficient of performance (COP) of thermal power plant is 36-39 %. A typical thermal power plant with a capacity of 2 million kW consumes 18,000 tons of coal, 150,000 $m^3$ of water and 2,500 tons of fuel oil every day. Some 7 million $m^3$ of water (every day) is used to cool the treated steam at thermal power plants, which leads to contamination of the water-cooler [1].

Thermal power plants are characterized by high toxic and radioactive contamination of the environment. This is due to the fact that the most common coal and its ash contain impurities of a number of toxic elements, including uranium, and in significant concentrations. Pollution is more significant during the construction of thermal power plants or even their complexes. New effects may appear, such as due to the high rate of oxygen combustion compared to the rate of its formation by photosynthesis of terrestrial plants, or caused by an increase in the concentration of carbon dioxide in the surface layer [1].

### 2.3 Prospects

Coal is the most promising source of fuel (coal reserves are huge when compared with gas and oil reserves). The main coal reserves are in Russia, the USA and China. At the same time, most of the energy is currently produced at thermal power plants through the use of petroleum products. Thus, the structure of fuel reserves does not correspond to the volume of its modern consumption. In the long term a complete transition to a new structure of fossil fuel (coal) will cause significant environmental problems, changes in industry and material costs. A number of States have already started basic energy restructuring [6].

If we analyze the hydro power plants, in this case the main advantages are:

- Fast payback (cost is about 4 times less, and payback is 4 times faster than at thermal power plants);
- Low cost of electricity;
- High maneuverability, which is very important during peak loads;
- Energy accumulation.

#### 2.3.1 Hydro Power

However, even with the full use of the potential of all the rivers of the planet, it is possible to provide a maximum of a quarter of the modern needs of mankind. No more than 20% of hydropower potential is used in Russia and many other nations around the world. At the same time, in developed countries, the efficiency of the use of water resources is 3 times higher, that is, Russia has certain reserves. However, the construction of hydropower plants (especially on flat rivers) will lead to many environmental problems. Reservoir necessary for the uniform operation of hydro power plants creates negative conditions to climate change in territories at a distance of hundreds of kilometers [2].

Blue-green algae that can develop in reservoirs have an impact on eutrophication processes (namely accelerate) and, unfortunately, it has a negative impact on water quality, as well as the functioning of ecosystems. Often, during the construction of reservoirs, there is a violation of natural spawning grounds, as well as flooding of a large portion of fertile lands. Also, certain changes related to the level of groundwater.

Great prospects are represented by hydroelectric power stations, which are built on River Mountains. The

 

reason for this is the greater energy potential of the rivers of the mountain plan in comparison with ordinary, flat ones. Also, it can be noted that during the construction of reservoirs in mountainous areas there is no flooding of fertile land (in large volumes).

**2.2.2 Nuclear**

Consider nuclear power plants that do not produce carbon dioxide during operation. At the same time, the level of air pollution by other elements is low compared to thermal power plants. It can be noted that the amount of radioactive substances that will be formed during operation is negligible. For a long period of time, nuclear power plants have been considered a complete replacement for thermal power plants, in terms of environmental friendliness and impact on global warming. But at the same time, the issue of safety of nuclear power plants has not yet been fully resolved. It can be noted that the process of replacing the power plant to nuclear power plant cannot be carried out in a mass format around the world, because it is accompanied by large amount of financial costs [5].

However, the Chernobyl disaster has significantly changed the understanding of the majority of the population regarding the safety of living and use of nuclear power plants around the world. That is why, the prospect of successive replacement of thermal power plants at nuclear power plants in many countries came to naught. There are several main problems in the use of nuclear power plants [8]:

1. The safe operation of the reactors. All reactors that are used in nuclear power plants carry a potential threat of a global accident. The earthquake and tsunami that struck eastern Japan on March 11, 2011, caused a serious accident at the Fukushima Dai-ichi nuclear power plant on the northeastern coast of Japan, accidents such as the Chernobyl disaster which occurred on April 26, 1986 can occur both because of wrong design of the reactors used, and because of the human factor or natural disasters. The principle of self-protection of the reactor core should be put into the principle of reactor design in any, even the worst-case scenarios. Nuclear technologies are complex and it will take years to understand their full potential [8].
2. When using nuclear power plants, there will always be some uncertainty about safety, and it will be difficult to solve all of them in advance [9]. Most of them will be detected during the use of reactors.
3. Reducing the level of carbon dioxide emissions. Many experts believe that the use of nuclear power instead of thermal power plants will reduce the amount of carbon dioxide emissions, one of the main gases that affect climate warming. But at the same time, power plants that operate on a combined cycle (natural gas) are much more economical not only than thermal power plants, but also nuclear power plants. At the same time, it can be noted that the amount of carbon dioxide emissions can be reduced at equal costs for the working process (the full period of work is taken into account).
4. Decommissioning of some nuclear power reactors. There are frightening statistics in Russia — in 2010, more than half of the working reactors were older than 25 years [3]. That is why we plan to phase out the reactors. According to the data provided by the world nuclear Association, about 130 reactors have already been decommissioned (or already in the extreme phase of withdrawal) [10]. And we can highlight the main problem that arises during this process of the disposal of radioactive waste. For safe disposal, they should be carefully isolated and maintained for a long period, the cost of this is commensurate with the cost of building a new nuclear power plant.

The danger of using nuclear power plants due to the possible proliferation of nuclear weapons. During the year of operation, one reactor will produce the amount of plutonium that will be enough to create several atomic bombs. Spent nuclear fuel which is necessarily formed after work contains many other elements. That is why the IAEA makes every effort to monitor the use of spent nuclear fuel in all countries where nuclear power plants operate [4, 11, 13].

A small atomic bomb can be created from the spent nuclear fuel of any reactor. But at the same time, to create a full-fledged nuclear bomb, it is necessary to organize a complex production, and attract a lot of specialists. But to create primitive homemade bombs, nothing of this is necessary and this is the main danger. It is this aspect that terrorists can take advantage of by acquiring the necessary materials on the black market. Although a nuclear explosion will not occur, but the area where you use this "home-made" will be quite heavily contaminated. Thus, I believe that renewable energy such as wind energy, geothermal, solar, wave, etc., modular stations used natural gas or fuel cells, recycling of exhaust steam and waste heat are the real ways to protect ourselves against climate change without the emergence of new threats to the modern world.

## CONCLUSION

Summing up, we note that the sunny concentrators cause huge shading of the land, which subsequently leads to very strong changes in soil conditions, to changes in the plants world. The undesirable ecological impacts on the ecology of the areas of location of the power stations cause a strong heating of the air through the passage of solar radiation through It is concentrated by mirror reflectors, which leads to changes in humidity, heat balance, and direction of beliefs. In addition, in certain cases, the possible damage of systems and overheating. The use of low-boiling liquids in conjunction with the inevitable leakage of them in solar energy systems with long-term operation

 

can lead to severe contamination of drinking water. Also of particular danger are various liquids that contain nitrites and chromates, and which are highly toxic substances.

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