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Role Of Renewable Energy Sources In Environmental Protection

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Abstract: *Renewable technologies are considered as clean sources of energy and optimal use of these resources minimize environmental impacts, produce minimum secondary wastes and are sustainable based on current and future economic and social societal needs. Sun is the source of all energies. The primary forms of solar energy are heat and light. Sunlight and heat are transformed and absorbed by the environment in a multitude of ways. Some of these transformations result in renewable energy flows such as biomass and wind energy. Renewable energy technologies provide an excellent opportunity for mitigation of greenhouse gas emission and reducing global warming through substituting conventional energy sources. In this article a review has been done on scope of CO_2 mitigation through solar cooker, water heater, dryer, bio fuel, improved cook stoves and by hydrogen.*

Keywords: *Renewable energy sources, solar Energy, Wind Energy, Bio energy, Hydrogen as fuel.*

I. Introduction

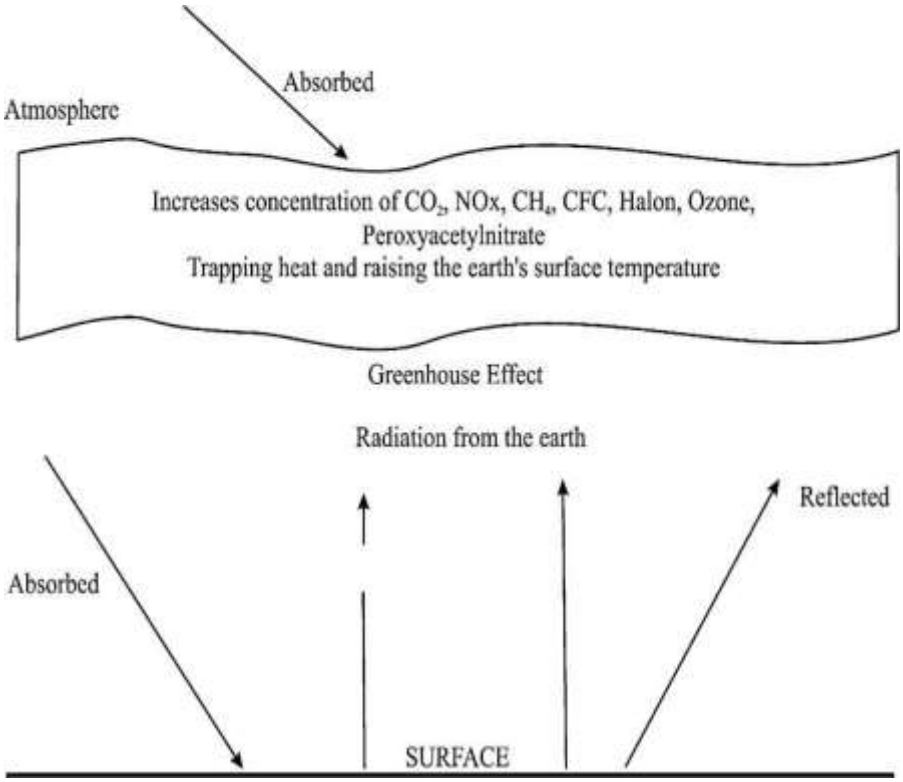
Renewable energy sources (RES) supply 14% of the total world energy demand [1]. RES includes biomass, hydropower, geothermal, solar, wind and marine energies. The renewable are the primary, domestic and clean or inexhaustible energy resources. [2,3]. Large-scale hydropower supplies 20 percent of global electricity.

II. Renewable Energy Sources

Renewable energy resources will play an important role in the world's future. The energy resources have been split into three categories: fossil fuels, renewable resources and nuclear resources [4]. Renewable energy sources are those resources which can be used to produce energy again and again, e.g. solar energy, wind energy, biomass energy, geothermal energy, etc. and are also often called alternative sources of energy [5]. Renewable energy sources that meet domestic energy requirements have the potential to provide energy services with zero or almost zero emissions of both air pollutants and greenhouse gases. Renewable energy system development will make it possible to resolve the presently most crucial tasks like improving energy supply reliability and organic fuel economy; solving problems of local energy and water supply; increasing the standard of living and level of employment of the local population; ensuring sustainable development of the remote regions in the desert and mountain zones; implementation of the obligations of the countries with regard to fulfilling the international agreements relating to environmental protection [6]. Development and implementations of renewable energy project in rural areas can create job opportunities and thus minimizing migration towards urban areas [7]. Harvesting the renewable energy in decentralized manner is one of the options to meet the rural and small scale energy needs in a reliable, affordable and environmentally sustainable way [8,9].

III. Climate Change Scenario

Climate change is one of the primary concerns for humanity in the 21st century [10]. It may affect health through a range of pathways, for example as a result of increased frequency and intensity of heat waves, reduction in cold related deaths, increased floods and droughts, changes in the distribution of vector-borne diseases and effects on the risk of disasters and malnutrition. The overall balance of effects on health is likely to be negative and populations in low income countries are likely to be particularly vulnerable to the adverse effects. The experience of the 2003 heat wave in Europe showed that high-income countries may also be adversely affected [1]. The potentially most important environmental problem relating to energy is global climate change (global warming or the greenhouse effect). The increasing concentration of greenhouse gases such as CO2, CH4, CFCs, halons, N2O, ozone, and per oxy acetyl nitrate in the atmosphere is acting to trap heat radiated from Earth's surface and is raising the surface temperature of Earth [2]. A schematic representation of this global climate change problem is illustrated below.

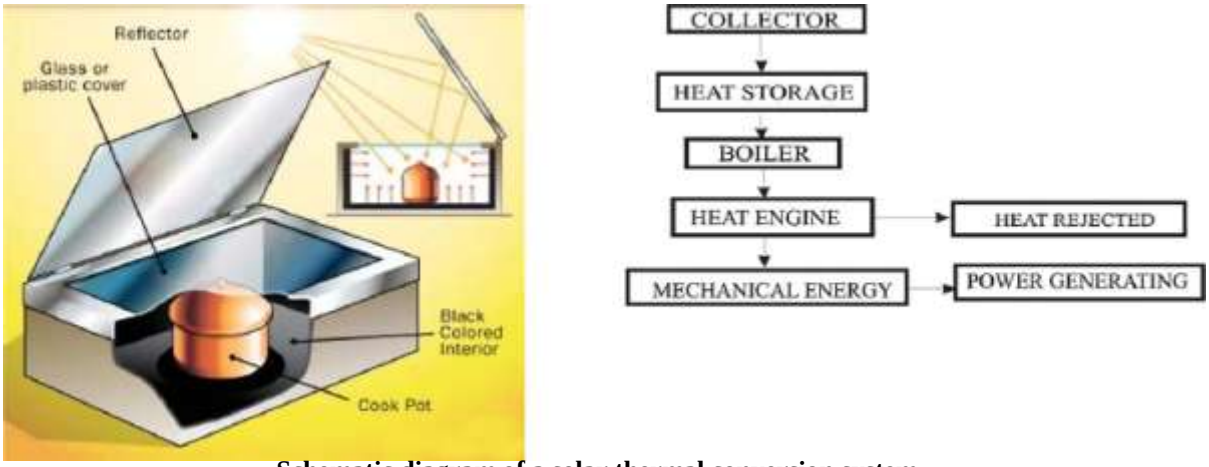


A schematic illustration of greenhouse effect.

IV. Solar Energy

Solar thermal application

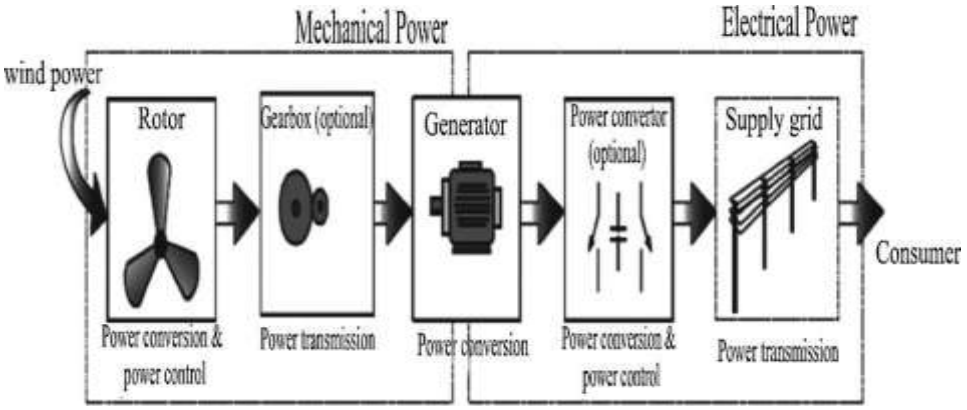
As far as renewable energy sources is concerned solar thermal energy is the most abundant one and is available in both direct as well as indirect forms. The Sun emits energy at a rate of 3.8×10^{23} kW, of which, approximately 1.8×10^{14} kW is intercepted by the earth [9]. There is vast scope to utilize available solar energy for thermal applications such as cooking, water heating, crop drying, etc.



Schematic diagram of a solar thermal conversion system.

V. Wind Energy

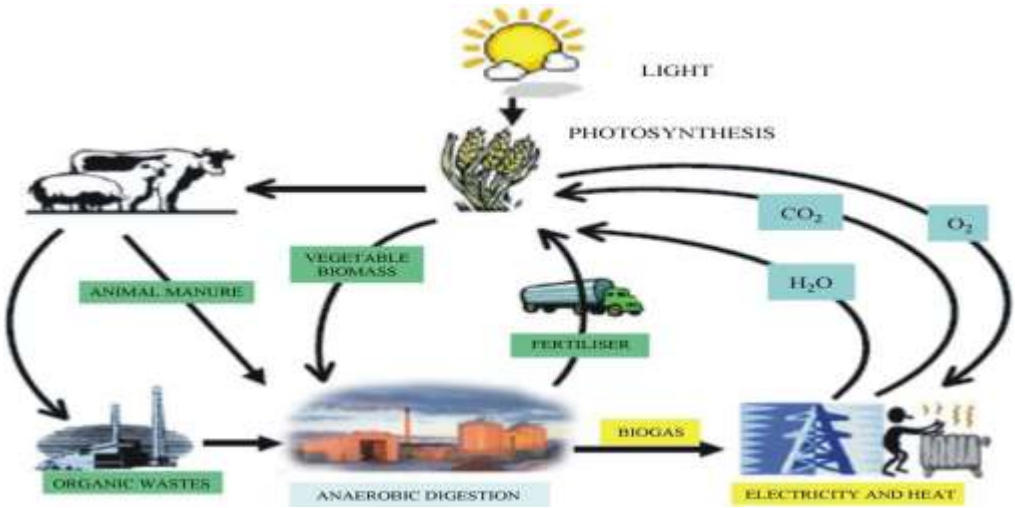
Of the renewable energy technologies applied to electricity generation, wind energy ranks second only to hydroelectric in terms of installed capacity and is experiencing rapid growth. India is one of the most promising countries for wind power development in the world [8]. Expansion of wind energy installed capacity is poised to play a key role in climate change mitigation.

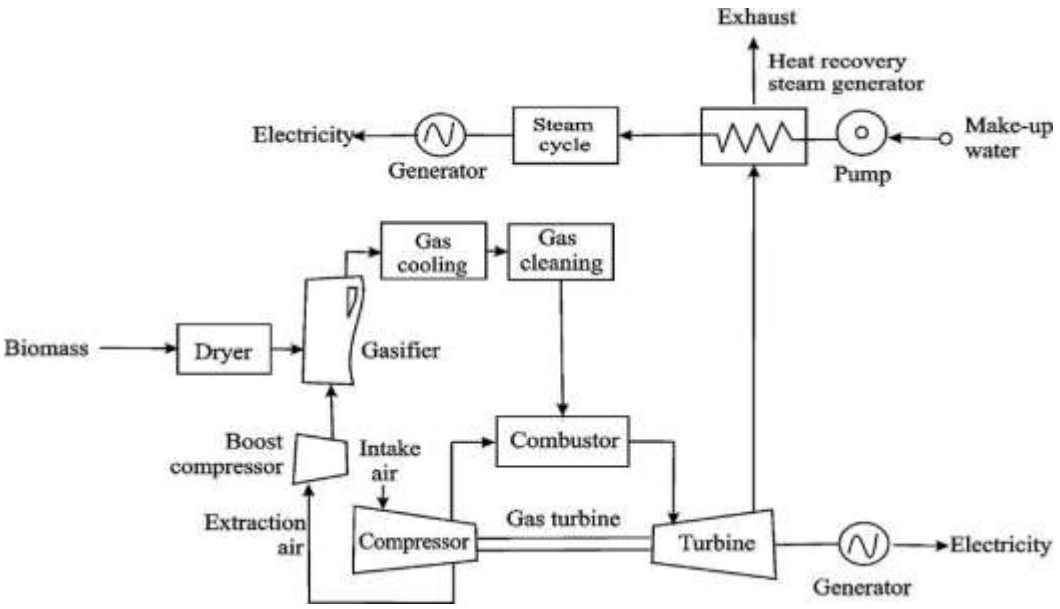


VI. Bioenergy

Biogas

The production of biogas through anaerobic digestion offers significant advantages over other forms of bioenergy production. It has been evaluated as one of the most energy-efficient and environmentally beneficial technology for bioenergy production. For the production of biogas it is possible to use several different raw materials and digestion technologies [7]. This variety and the various fields of application for the biogas and digested product result in great differences in the environmental performance among the potential biogas systems. Among the raw materials are organic waste from households and the food industry, dedicated energy crops, and agricultural waste products, such as crop residues and manure [9].





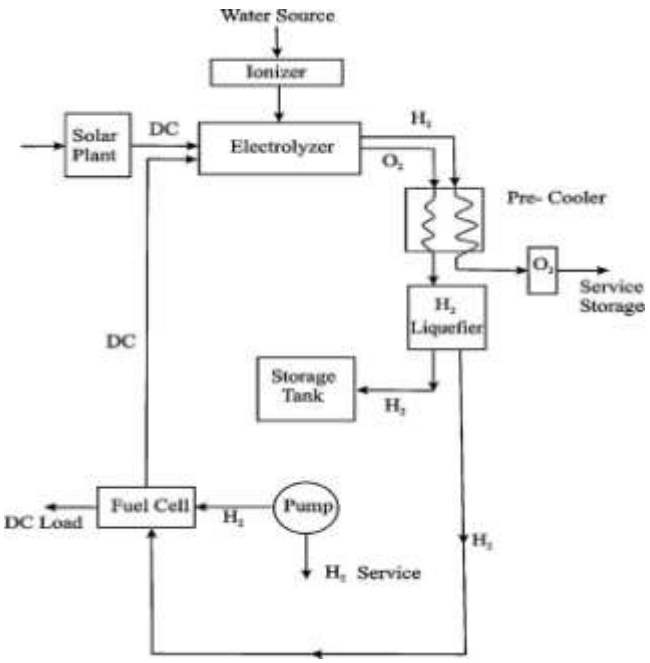
VII. Hydrogen As Fuel

Hydrogen has fascinated generations of people for centuries, including visionaries like Jules Verne. Hydrogen is expected to play a key role in the world's energy future by replacing fossil fuels. Hydrogen is gaining increasing attention as an encouraging future energy [10]. Its conversion to heat or power is simple and clean. When burnt with oxygen, hydrogen generates no pollutants, only water, which can return to nature. However, hydrogen, the most common chemical element on the planet, does not exist in nature in its elemental form. It has to be separated from chemical com-pounds, by electrolysis from water or by chemical processes from hydrocarbons or other hydrogen carriers. The electricity for the electrolysis may come eventually from clean renewable sources such as solar radiation, kinetic energy of wind and water, or geothermal heat. Therefore, hydrogen may become an important link between renewable physical energy and chemical energy carriers [9].

Pyrolysisofbiomass → H_2 + CO_2 + CO + Hydrocarbon gases

Catalytic steam reforming of biomass → H_2 + CO_2 + CO

Gasification of biomass → $H_2 + CO_2 + CO + N_2$



VIII. Conclusion

A comprehensive literature survey of major renewable energy gadgets for domestic and industrial applications such as solar water heaters, solar cookers, dryers, wind energy, biogas technology, biomass gasifiers, improved cook stoves and biodiesel was made. The review gives an overview of the development and scope of CO_2 mitigation for clean and sustainable development. The use of solar drying of agricultural produce has good potential for energy conservation in developing nations. Biodiesel from no edible vegetable.

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