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1. Renewable Energy - An Eco Friendly Source of Green Energy: A Review

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Abstract:

The electricity requirements of the world including India are increasing at alarming rate and the power consumption has been running ahead of supply. It is widely recognized that the fossil fuels and other conventional resources, presently being used for generation of electrical energy, may not be either sufficient or suitable to keep pace with ever increasing demand of the electrical energy of the world. Generation of electrical power by this conventional method causes pollution. On the other hand the renewable energy is a form of green energy and is thus eco friendly to the environment. Renewable energy is very low in cost and it does not have a much negative impact on the environment. The conventional source of energy may come to an end after a certain period, but renewable resources will never end. These sources are infinite because the source like sunlight, wind will never end or stop. Those sources can be used to generate electrical energy in very low cost. The non-conventional methods of power generation may be such as solar cells, fuel cells, thermoelectric generator, wind power generation, geothermal and tidal power generation etc. The increase of this kind of green energy will only slow down the global warming of the earth and may decrease the air pollution.

Keywords: Alarming, Fossil fuels, Green energy, Pollution.

Introduction:

Due to the increasing daily requirement of energy of people across the world, the world is rapidly turning into a global village. To satisfy the social and economic development, the need for energy and its related services are increasing at an alarming rate (Asumadu-Sarkodie & Owusu, 2016a). In today's world 1.4 billion people lack access to electricity (Kaygusuz, 2012). The number of rural communities depending on the traditional usage of biomass is projected to rise from 2.7 billion today to 2.8 billion in 2030 (Abbasi *et al.*, 2011). The increase of fossil fuel-

based power generation (coal, oil and gas) and the simultaneous increase in population have resulted in a growing demand for energy, thus resulting in enormous growth in the emissions of carbon dioxide (CO_2) (Asumadu-Sarkodie & Owusu, 2016a). The ill effects on health and environment, the depletion of natural resources, adverse effects on the climatic conditions are the primary reasons to shift the use towards renewable resources (Masera *et al.*, 2015).

Renewable Energy

The energy which is generated from natural processes and is continuously replenished is called the renewable energy. This includes sunlight, geothermal heat, wind, tides, water, and various forms of biomass (Table 1). This energy cannot be exhausted and is constantly renewed. Here we will discuss about some of them.

Reliable energy supply is essential in all economies for heating, lighting, industrial equipment and transport (Tester, 2005). Fossil fuels when replaced by renewable energy supplies reduce the greenhouse gases emission to a large extent and thus reducing global warming. Despite the enormous advantages of renewable energy sources, there are a few shortcomings too. Most of the renewable energy sources are dependent on the climates. Due to the seasonal variations, the discontinuity of their generation is the major shortcoming. So their exploitation needs complex design, planning as well as controlled optimization methods (Lau *et al.*, 2012).

Table 1. Renewable energy sources and their use

Energy sources	Energy conversion and usage options
Hydropower	Power generation
Modern biomass	Heat and power generation, pyrolysis
Geothermal	Urban heating, power generation, hydrothermal
Solar	Solar home systems, solar dryers, solar cookers
Direct solar	Photovoltaic, thermal power generation, water heaters
Wind	Power generation, wind generation, windmills
Wave and tide	Numerous design, barrage, tidal stream

Renewable Energy And Climate Change

The topic of Climate Change is a great issue both at the scientific and political level. Since the beginning of the creation, climate has been changing at a slow and gradual pace. But the alarming speed of climate change during the recent years is one of the major threats that the earth is facing in the recent years. The carbon dioxide level in the atmosphere has increased over the last 36 years or so (Pimentel *et al.*, 2002). For over a decade, the main objective of scientists and researchers is to keep the global warming below 2 °C (Rogelj *et al.*, 2013). Studies suggest

that the consumption of fossil fuels is the main source of greenhouse gases, and the concentrations have increased to over 390ppm above the industrial levels (Esteban and Leary, 2012). On the contrary the renewable technologies are known as the clean source of energy. The optimum use of renewable resources decreases the environmental impacts, thus producing lesser amount of secondary wastes (Panwar *et al.*, 2011).

Hydropower

Humans have been capturing the energy of moving water for over hundreds of years or more. Hydroelectric power is generated by harnessing the power of moving water in-order to generate electricity. This is the largest source of emission-free and renewable electricity (Chang *et al.*, 2010). Gravity and the height from which the water falls down to the turbine provide the primary energy. The development of hydropower reservoirs provides multiple uses such as irrigation and drinking water facility, flood and drought control as well as navigation (Bilotta *et al.*, 2016). Hydroelectric power generation can be termed as a green source of energy as it does not produce greenhouse gases (Truffer *et al.*, 2001). Although it provides immense benefits for the socioeconomic development of the country, it has some disadvantages too. Hydropower reservoirs are often created artificially which leads to the flooding of the natural environment. As a result of which many people are rendered homeless. Hydroelectric structures also adversely affect the river body's ecology and also disturb the ecological continuity of sediment transport process (Coutant and Whitney, 2000). By the building of dams, dikes etc. fish migration is also interrupted (Baran and Myschowoda, 2009).

Solar energy

Solar energy is the radiant light and heat harnessed from the sun by using varieties of technologies such as solar heater, photovoltaic cells, solar architecture and so on. It does not have any negative drawbacks and is environment friendly. The energy from the sun is free and abundant, so the generation cost of solar energy is very much less than the generation cost of fossil fuels (Oji *et al.*, 2012). According to the World Energy Council (2013), "the total energy from solar radiation falling on the earth was more than 7500 times the world's total annual primary energy consumption of 450 EJ" (Urban and Mitchell, 2011). There is a range of solar energy applications installed world-wide for producing electricity. However there are some barriers too. Solar power generation depends on the availability of solar radiation. Climatic conditions which can affect cloud cover and solar radiation gives back negative effects on solar

power generation. Photovoltaic cells can operate on cloudy hours of the day, but mirror-based solar thermal applications need direct sunlight (Agrafiotis *et al.*, 2005).

Geothermal energy

The term Geothermal comes from two Greek words 'GEO' and 'THERM'. 'Geo' means the earth and 'therm' means heat. The clean, sustainable form of energy obtained from the interior of the earth in the form of heat energy is known as the geothermal energy. The heat originates from the internal structure of the planet and the different physical processes occurring inside it. But this heat inside the earth's crust is unevenly distributed and is often at depths which are too hard to be exploited by mechanical processes (Bagher *et al.*, 2014). From the geothermal reservoirs heat is mined by the use of wells. There is no wastage or generation of by-products in this case, as well as the maintenance cost of geothermal power plant is very less (Bagher *et al.*, 2014). The permeable reservoirs which are naturally and adequately hot are called the hydrothermal reservoirs and the reservoirs which are improved by hydraulic stimulation are called the enhanced geothermal systems (EGS) (Kolditz *et al.*, 2017). These fluids of different temperatures can be used to generate electricity as well as for other purposes requiring heat energy. It has some disadvantages too; such as there are only few sites which have the potential of geothermal energy, chances of eruption of volcano and also some harmful, poisonous gases might be released that can escape through the holes drilled during construction (Kolditz *et al.*, 2017).

Conclusion

Energy is an essential ingredient in our daily life as a way of improving human development including economic growth and productivity towards a modern civilization. The return-to-renewable will help to overcome the climate change in a marvellous way but it needs to be sustainable in order to ensure a sustainable future for generations to encounter their energy demands.

As we look ahead to our clean energy future, it seems that knowledge regarding the correlations between sustainable development and renewable energy is still not sufficient. The focus of the paper was to intuit if renewable energy sources were sustainable and how a jump from fossil fuel-based energy sources to renewable energy sources would help to reduce climate change and its impact. A qualitative research was enlisted by reviewing papers in the extent of the study. Despite the fact that, the complete lifecycle of renewable energy sources have no net

emissions yet will help to counter future global greenhouse gas emissions. In spite of that, the cost price, political scenario and market conditions have become a roadblock which prevents developing, least developed and developed countries to fully exploit its potentials.

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