

Compering Between Solar Energy and Fuel Energy

Name: Ibrahim Al-Anazi

371103807

Electrical Engineering Department, College of Engineering, Majmaah University,
Kingdom of Saudi Arabia

ABSTRACT

The demand for electricity energy has been on the rise in Saudi Arabia, which has constrained the available resources, therefore, to meet this disparity there is need to expand the power generation. The common power generation methods have negatively affected the human health through environmental pollution and greenhouse gas emissions. Therefore, an alternative source of energy that can preserve the environment by eliminating pollutions and can provide support to the available sources during the peak hours. This report compares solar energy and fossil fuels based on merits or demerits, uses and the economics.

Keywords:- Solar Energy, Economic, Fossil Fuels Energy.

TABLE OF CONTENTS

Abstract	211
1 Introduction	213
2) Electricity generation.....	214
2 A). Electricity generation of solar energy	214
2. B) Generation of Fuel Energy Using Electricity.....	214
3) Natural effect on a Solar cell system	215
4) How Natural effect on a Solar cell system can be avoided.	216
5) Advantages of Fuels Energy And Solar Energy:	219
A. Advantages of Solar Energy	220
B. The Disadvantages of Solar Energy	221
6. Conclusion.....	222
8. References	223

CHAPTER ONE

INTRODUCTION

The energy consumption around the world is higher depending on whether a nation is developed or industrialized. In developed countries the energy consumption per capita is higher and similarly, the developing counts realize a low per capita consumption of energy. It is identified that there is a correlation between the energy consumption in a country and its living standards. Consequently, the twentieth century records the highest energy consumption, because of the increased demands in the industrialized nations which likely indicates that in few years' time the world will experience depletion in reserves of the petroleum and natural gases. Hence, this will lead to overdependence on alternative sources of energy.

Fuels are defined as dense repositories of energy that are consumed to provide energy services such as heating, transportation and electrical generation. [1] Primary energy sources are those which get their energy from the sun, this means that almost all the fuel sources get their energy from the sun. While on the topic of energy consumption, a critical angle of conservation is imperative which is limited energy consumption.

The current energy consumption statistics shows that over 95% of energy consumed by humans come from energy fuels. However, the power generating sources that use fuels. provide for about 85% of the electricity supply in the grids. The electricity is consumed in heater and various other appliances that human use on daily basis. [2] The other sources of electricity such as hydro-generation methods supplement the energy sources but due to fluctuating water levels, the power the power generation agencies are forced to supplement the energy sources through fuel powered plants.

The continued use of fossil fuels in running daily operations is one of the major factors that will greatly affect the biomass energy usage. However, the link between fossil fuel consumption and the quality of environment as not been established globally contrary to how the use of solar energy as a source of electricity has been identified.

The electricity energy generated from the sun is known as solar energy. The sun rays are converted when the rations from the sun which produces heat causes a chemical reaction and hence generating electricity. Solar energy is highly available on earth and can sustain the world needs more than what is currently needed. Even though, this source of energy has not been adequately harnessed and if proper resource allocation can be channeled to the project of establishing an infrastructure of capturing the solar energy, then there can be sufficient supply of alternative energy to satisfy the future needs. Currently, more organization and industries have stated embracing the use of solar energy for example the motor vehicle industry by manufacturing electric cars. This shows that more people in the 21st century will adopt the use of solar energy because of the benefits such as being renewable, and nonpolluting, unlike the fossil fuels which are finite and may get depleted.

Currently harnessing the solar energy can be achieved through the following three ways, photovoltaics, solar heating & cooling, and concentrating solar power. Photovoltaics is a method of directly generating electricity form the electronic process which can be used to power different appliances such as calculators to powering homes and commercial businesses. Solar heating & cooling (SHC) and concentrating solar power (CSP) are direct use of heat from the sun to run the electricity turbines to produce electricity when considering CSP and to heat water when considering SHC.

CHAPTER TWO

ELECTRICITY GENERATION

A. Electricity generation of solar energy

Photovoltaic cells (PV cells) or solar cells are important in converting solar radiation directly to electricity. Moreover, in PV cells, when light strikes the junction between a semiconductor like silicon and a metal, or rather between two semiconductors, a small electric voltage is generated. Furthermore, a single PV cell generates a power of approximately 2 Watts. However, when large number of individual cells are connected together like in solar-panel rays, large amounts of kilowatts of electric power are generated in a solar electric plant as evident in large household arrays. Besides, currently, the PV cells generate energy of about 15% to 20% efficiency. [3] However, it is disadvantageous because the large and costly assemblies of the required cells are needed for the purpose of producing moderately high amounts of power, because of low solar radiation intensity.

Moreover, small PV cells can work on artificial light or sunlight, and therefore, can use low-power applications such as watches and calculators. However, other devices such as communication systems, communication satellites, and water pumps have their power provided by larger units, especially in remote regions. Additionally, home owners can use emerging technologies of thin-film solar cells and install classic crystalline silicon panels to provide energy. Furthermore, homeowners and businesses can build integrated photovoltaic on the rooftops to replace the expensive electric supply. Furthermore, light intensity can be increased by having concentrated solar power plants on small blackened receiver surfaces for the purpose of producing high temperatures. Also, the arrays of aligned lenses and mirrors can be used in producing enough sunlight that can help in heating at a temperature of 3,600°For 2,000°C. The heat produced can be used in operating different devices such as boilers which can be used in generating steam used in steam turbine electric generator power plant. [4]However, in order to produce direct steam, it is important to arrange the movable mirrors in such a way that they are concentrated to produce large amounts of solar radiation when they reach the blackened surfaces in which water is circulated and heated.

B. Generation of Fuel Energy Using Electricity

Natural gas entails methane, that produces a lot of energy. Methane is lighter than hydrocarbon. Besides, methane does not produce smell or gas color. The history of the formation of gas is traced down in the ancient period in which some animals and plants collapsed and were trapped beneath the extreme pressure and heat. They decomposed later and the material that resulted from their decomposition formed as that was confined in porous rocks in various locations. Hence, to generate heat from natural gas, the gas has to undergo a process of combustion after it has been mined from the wells, it is treated and then burned precisely to yield energy. Besides, natural gas burns cleaner as opposed to other sources of energy thus branded as a substitute form of clean energy. When compared to carbon monoxide, nitrous oxide and carbon dioxide, natural gas burns almost completely and emits minimal detrimental particles that are harmful to the health of humans. Natural gas is available in huge amount thus widely accepted as the alternative source of energy because it is cheaper. Natural gas just like fossil fuel is a non-renewable source of energy even though it produces less emissions when burned. In the combustion chamber, the burning process of natural gas is done after which it is channeled to the turbine. The turbine spins the gas to produce electrical energy as the final product. Solar energy is one of the renewable source as an inevitable CARE.

CHAPTER THREE

NATURAL EFFECT ON A SOLAR CELL SYSTEM

The natural effect of a solar cell system are different depending on the technology that includes photovoltaic solar cells (PV solar cells). Moreover, the system scale that ranges from small and distributed photovoltaic arrays from the rooftop to large utility scale of photovoltaic solar cells plays important roles in the natural effects of the solar cell system. Therefore, some of the factors affecting the designing of a photovoltaic system in natural life are cloudy days or dust and temperature. These two factors are very important and should be considered when designing a photovoltaic system since they affect the battery number as well as the photovoltaic module numbers. [1]For instance, when it comes to temperature, it affects the output power of the PV solar cells, thus increasing the number of the PV solar cells modules. On the other hand, the cloudy or dust days affects the number of battery that stores the power required for the output since the generating power is not enough to generate the solar cells.

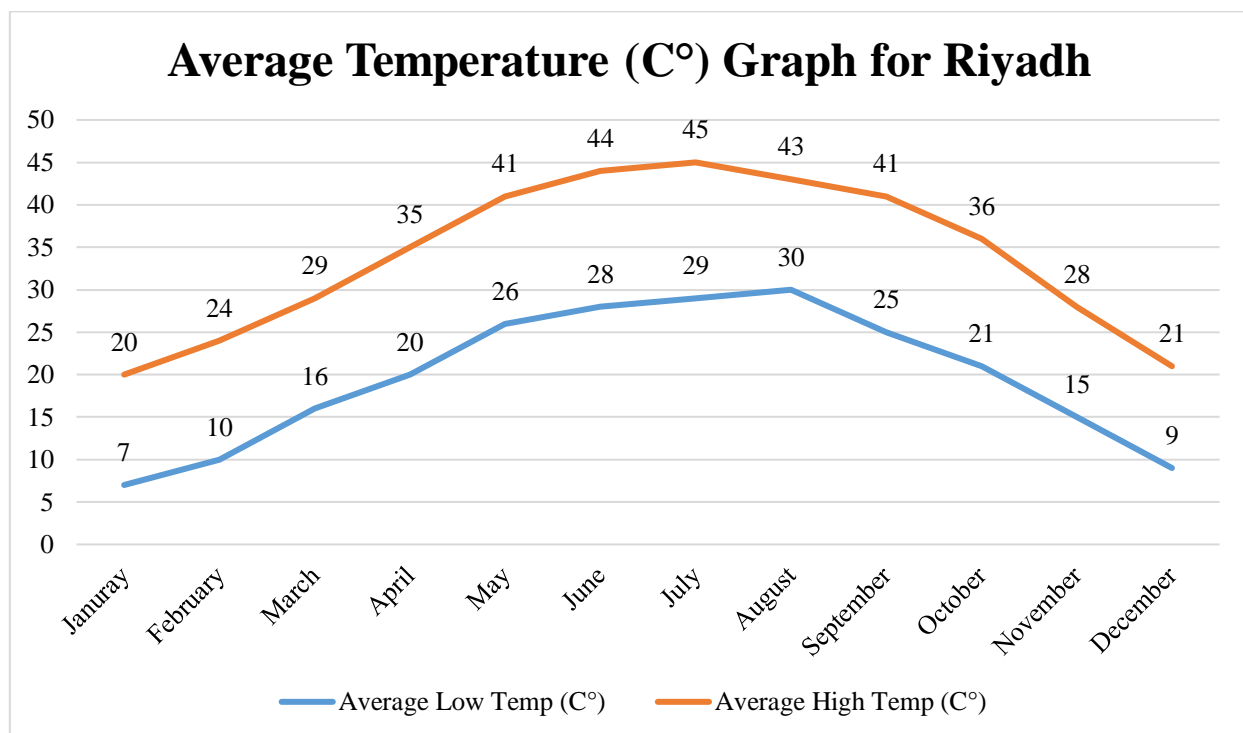


Chart 1: Shows the average temperature between (2000-2012)

According to the chart shown above, it indicates that the month of July had the worst or rather high temperature of 45°C as compared to other months. This means that during the month of July, there was a decrease in the power output by approximately 10% because each increase centigrade affects the power output by 0.5%, thus reducing the efficiency of the power output. Moreover, in each module, the power output is 220W, however, as a result of the high temperatures, the new power output was reduced to 200W. [3]

CHAPTER FOUR

HOW NATURAL EFFECT ON A SOLAR CELL SYSTEM CAN BE AVOIDED

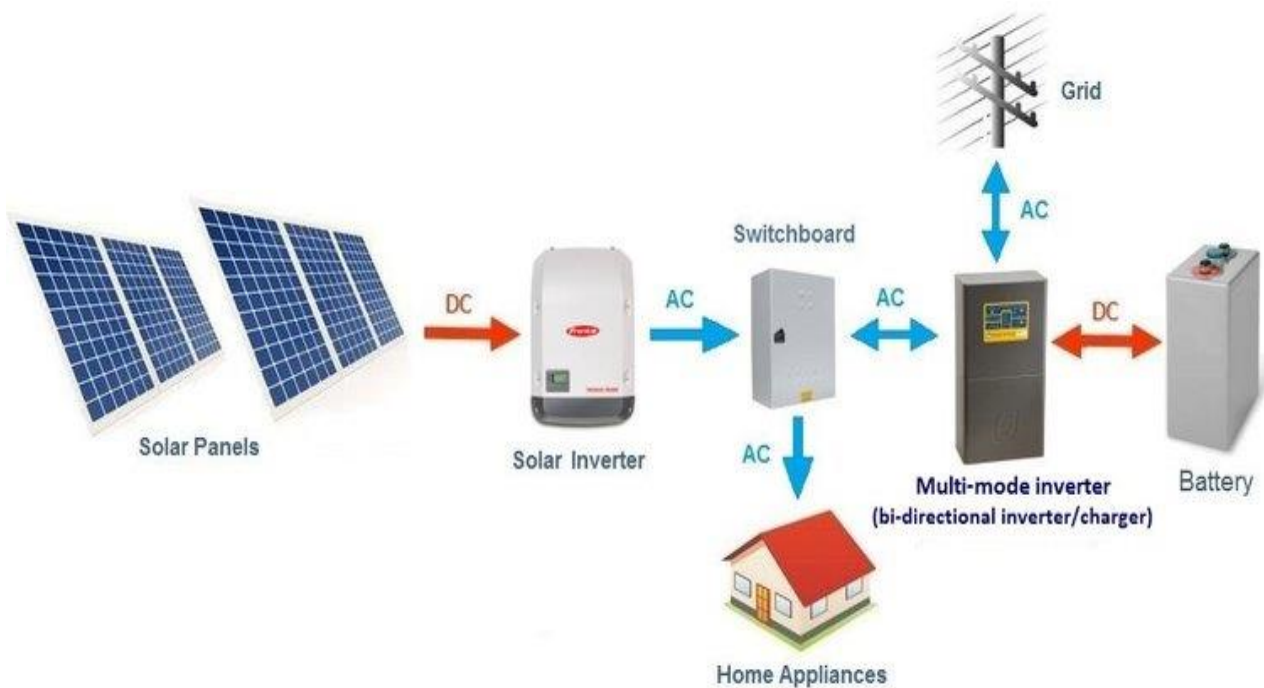


Fig. 3: Shows the basic layout diagram of an AC coupled solar battery system - Grid-tie (hybrid) setup

Furthermore, in a cloudy or dusty season, the PV solar cells require enough battery for half the period in order for the PV system to be stable. Therefore, batteries are important in storing energy from a solar panel that can be used when the weather is overcast.

A. The Effect of Fuel Energy on Nature



Fig. 4: The emission of air pollutants from the burning of fossil fuels is the main cause of air pollution in urban areas

There are different ways in which fuel energy affect nature. For instance, fuel energy affects water, leading to water pollution. For example, when oil spills on water, it affects the aquatic life as well as the living things in water, thus, making water unsafe even for human beings. The oil spills affect that habitat of living things in water and reduces the concentration of oxygen in water. [5]

Furthermore, coal mining is another major water pollutant that should be taken into consideration. For instance, the change in the flow of groundwater from mining activities cause water to mix with toxic mineral sources that have leaked out of soil, thus, forming acidic mineral water. The acidic water is harmful to plants and roofs, thus, affects the environment. Solid waste is considered to be a by-product of different forms of energy and it affects the natural environment[5].

B. Equivalent Circuit

To see how does the sunlight based cell work; we have to characterize its identical circuit. The approximated identical circuit appeared in the following figure.

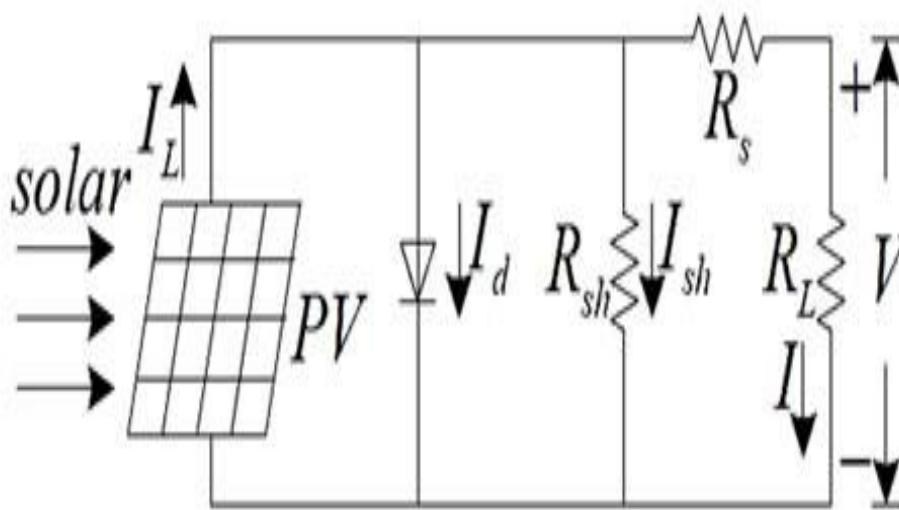


Fig. 5: Equivalent circuit mode

As shown in Figure 7 , I is the load current, R_s and R_{sh} is the internal series and parallel resistance respectively, I_L is the photovoltaic current, I_d is the junction current if the diode.

$$I = I_L - I_d - \frac{V + IR_S}{R_{SH}}$$

$$I_d = I_o \left[\exp \left(\frac{q(V + IR_S)}{AkT} \right) - 1 \right]$$

$$V_{oc} = \frac{kT}{q} \ln \left(\frac{I_L}{I_o} + 1 \right) \approx \frac{kT}{q} \ln \left(\frac{I_L}{I_o} \right)$$

We can simplify the equivalent circuit to the circuit

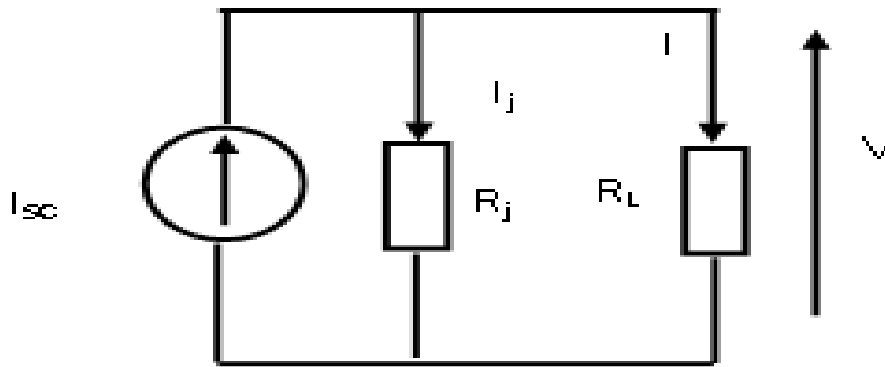


Fig. 6: Simplified equivalent circuit model

$$R_j = \frac{V}{I_j} = \frac{V}{I_s - \frac{V}{R_L}}$$

$$\therefore R_j = \frac{VR_L}{I_s R_L - V} = \frac{IR_L}{I_s - I}$$

Where R_j is representing non-linear variable junction resistance.

C. Battery bank

Batteries used to spare the bounty control brought by methods for PV structure. Batteries give the vitality to the evening time, or if the pile is more than the made vitality by a PV system. The battery execution isn't generally fix persistently; it shifts pair to a couple of reasons. The presentation of the battery depends on the environment, temperature, charge and dispatch cycle, age, etc. There are different sorts of the battery, given that joined some compound materials will outline a battery. The issue with that, a part of those batteries conveys an incorporate impact anyway it cost a stunning arrangement of coins, while some of them offers low power easily. The most reasonable battery lately is lead-destructive battery. Examining battery length, in a great case, a battery money related foundation need to have the choice to shop oversee for five days on obscure atmosphere. One progressively gigantic issue, battery is assessed by their cycle, there are various cycles beginning from shallow cycle "10-15%" and significant cycle "50-eighty%". Each type used for express utility. Shallow cycle is the top notch for passing on a hundred of amperes for fast time "seconds", while the significant cycle is fitting for passing on more than one amperes for long time "hours". Shallow cycle applied for vehicle for starting the engine even as significant cycle used for PV structure.

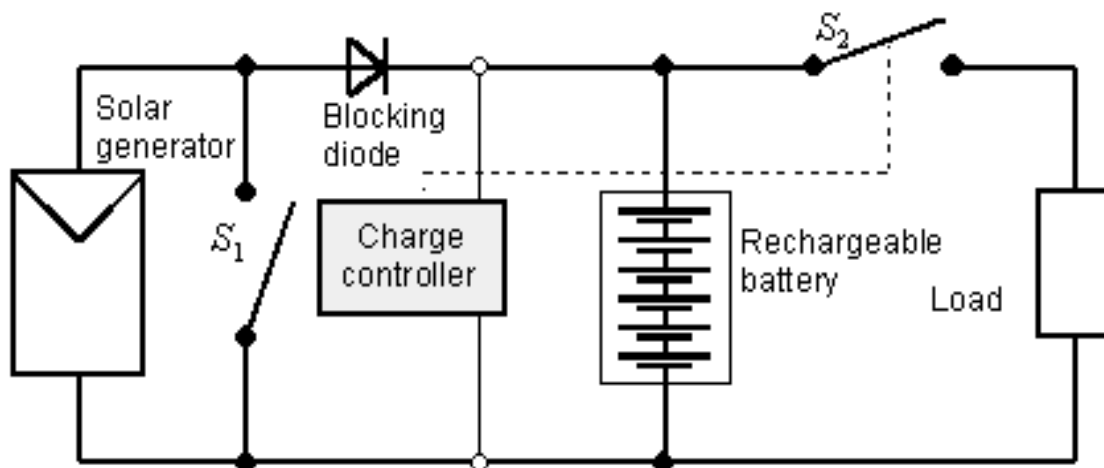


Fig. 7: PV system with charge controller "Voltage regulation" and Battery

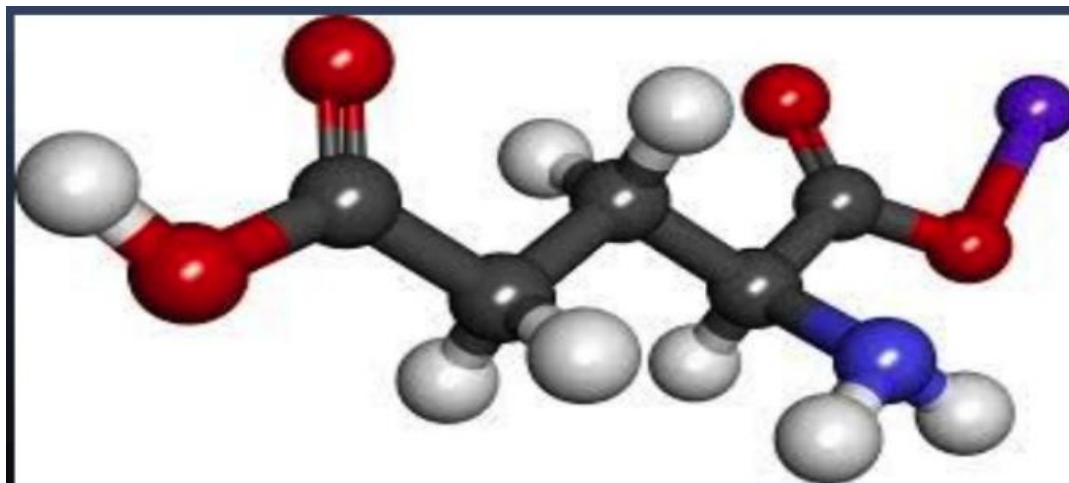
CHAPTER FIVE

ADVANTAGES OF FUELS ENERGY AND SOLAR ENERGY

- Contains high calorie content

This refers to the amount of energy that fuels contain. Hence, the calorie value is measured based on the heat intensity produced in the process of complete combustion of a given amount of fuel.

- Reliable source of energy
- Entirely stable



- Numerous economic benefits
- It is a cheaper energy source

Fossil fuel is available in huge volume hence a cheaper source of energy across the globe. The process of extracting and refining fossil fuel might be costly but the fuel produced is consumed by a bigger population.

- It is easier to set up
- source of job creation
- It is abundant
- Transporting it is safe

Fossil fuel can be easily transported because of their stable nature. This can be done efficiently up to longer distances using large trucks designated for the purpose of transporting fuel [5]. Hence, the technique is cost effective as pipes are used to pump fuel above the ground as well as below the ground.



Fig 8: Transportation of fossil fuels

- It is a beneficial by product

A. Advantages of Solar Energy

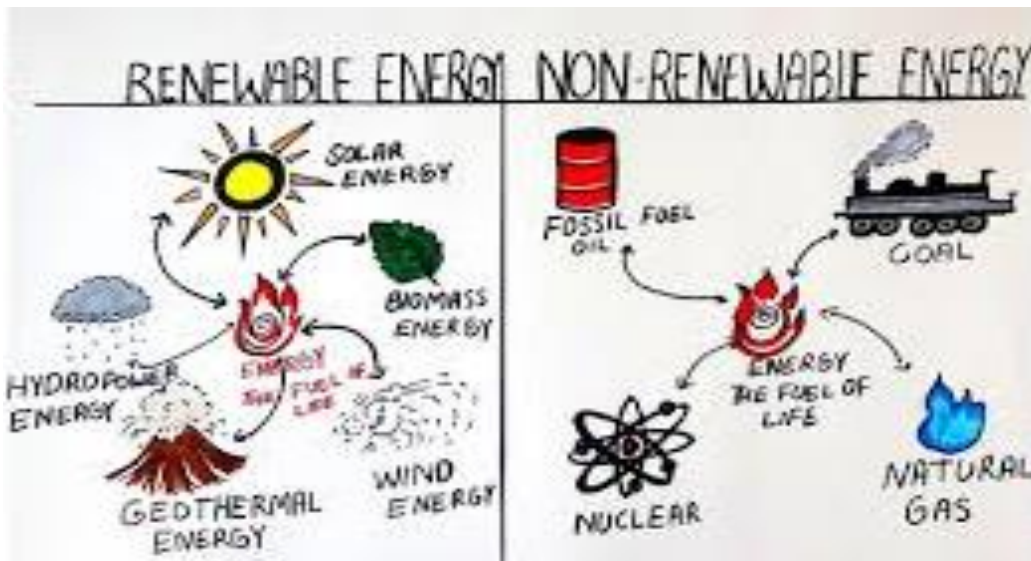


Fig. 9: Pictorial presentation of renewable energy

- Renewable Source of Energy
- Low Cost of Maintenance
- Reduces the Bills for Electricity
- Technology Development

The solar industry is undergoing technological advancement that is yet to increase in the coming years. Through nanotechnology and Quantum physics, innovation has increased the effectiveness of solar energy and thus has surpassed the electrical input of the solar power systems projected in the near future.

- Varied Application

➤ *Disadvantages for Fuels Energy and Solar Energy:*

Disadvantages of Fossil Fuels

- Environmental Hazards
Fossil fuels are prone to environmental pollution because they release carbon dioxide to the atmosphere which is dangerous to both human and plants life when inhaled.



Fig. 10: impact of fossil fuels

- Non Renewable
- These sources of energy will lessen in the coming years since they cannot be renewed. Figure 7, shows the exact image of fossil fuels. I.e. their supply is low.

- Effects on Human Health
- The dangerous elements that are remitted to the environment by fossil fuels combustion and greenhouses causes serious health complication such as cardiovascular disease, asthma and chronic bronchitis among other disease.
- Causes Disastrous Accidents
- Accidents caused by fossil fuel are dangerous and results to more damages when compared to renewable sources of energy such as solar panels and compost.
- Requires Huge Reserves
- The coal plants consume large volume of coal that is supplied regularly to maintain the amount of energy needed. Hence, the coal plants have to be huge in size.
- Overdependence
- It requires difference process for it to be refined for use.
- Fluctuations of Price
- The prices of fossil fuels depend on market influences. Hence highly inclined to price fluctuations. The effect might be detrimental to countries that have to import their fossil fuel thus a blow to them.
- Impact of Oil Spillage on Aquatic Life
- When fossils fuel spills on water, it becomes hazards to aquatic life. For instance, it reduces oxygen content of water. During transportation, they might also spill since they are transported using airplane, trains, ship and trucks from their reserves to different destinations. In addition, the process of extracting fossils is dangerous. I.e., when coal is being extracted, it become unsafe since it contains more oil, thus causes acidification to the environment as well as erosion. This results to land damages. It therefore important for the global nations to seek for an alternative source of energy such as compost, wind turbines, tidal generators and solar panels to reduce the already damage caused by fossil fuel extraction. The energy produced by fossil fuel is enough but does not satisfy the greedy nature of human.

B. The Disadvantages of Solar Energy

- The Storage of Solar Energy is Expensive
- It requires large batteries to be stored since most of it is consumed right away.
- Cost
- The cost of solar entails wiring, the solar panels, installation and batteries thus it might be expensive.
- Requires a Lot of Space
- Solar panels will be needed in plenty according to the amount of electricity required. Hence, more solar installed may consume a bigger space.
- Linked to Pollution
- The system of energy regulation can be linked o pollution, however, the intensity of pollution is minimum as compared to other sources of energy.
- Weather Dependent
- The efficiency of solar energy is likely to reduce during rainy and cloudy days. Hence, they mostly depend on sunlight to work as required and gather sufficient solar energy.

CHAPTER SIX

CONCLUSION

The solar energy is likely to be more attractive because of its renewable state. It does not cause pollution as well as being supplied in plenty. On the other hand, fossil fuel had attracted a larger volume of the Saudi Arabia due to its geographical location i.e. the sun-belt region. Thus, natural gas, fossil fuel and petroleum are the largest source of energy in Saudi Arabia. When the indirect costs of fossil fuel are included, solar energy exceeds the conventional generation of energy. Hence, clean energy is generated by the processing of sunshine through photovoltaic cells.

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