Alternative Energy For Sustainable Development

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Abstract- *This paper discusses the perspective of the renewable energy (Solar energy, Wind energy, Hydro energy, geothermal energy). There are three major technological changes: energy savings on the demand side, efficiency improvements in the energy production, and replacement of fossil fuels by various sources of renewable energy. This paper discusses the problems and perspectives of converting present energy systems into a 100% renewable energy system. Many developing countries have been apparently trying to restructure their energy sectors. The primary objective for deploying renewable energy in India is to advance economic development, improve energy security, improve access to energy, and mitigate climate change. Sustainable development is possible by use of sustainable energy and by ensuring access to affordable, reliable, sustainable, and modern energy for citizens. Strong government support and the increasingly opportune economic situation have pushed India to be one of the top leaders in the world's most attractive renewable energy markets. The government has designed policies, programs, and a liberal environment to attract foreign investments to ramp up the country in the renewable energy market at a rapid rate. It is anticipated that the renewable energy sector can create a large number of domestic jobs over the following years. The conclusion is that such development is possible. The necessary renewable energy sources are present, and if further technological improvements of the energy system are achieved the renewable energy system can be created*

Keywords- Renewable Energy, Combustion, World Wide Web, Energy efficiency, Biology, Wind, Sun, Water

I. INTRODUCTION

Renewable energy source:

A renewable energy source means energy that is sustainable - something that can't run out, or is endless, like the sun. When you hear the term 'alternative energy' it's usually referring to renewable energy sources too. It means sources of energy that are alternative to the most commonly used non-sustainable sources - like coal.

Renewable energy is useful energy that is collected from renewable resources, which are naturally replenished on a human timescale, including carbon neutral sources like sunlight, wind, rain, tides, waves, and heat. The term often also encompasses biomass as well, whose carbon neutral status is under debate. This type of energy source stands in contrast to fossil fuels, which are being used far more quickly than they are being replenished.

Renewable energy often provides energy in four important areas: electricity generation, air and water heating/cooling, transportation, and rural (off-grid) energy services.

Importance of Renewable Energy to Our Future:

While this may sound a bit dramatic, it's actually quite true. If we don't start to replace the unsustainable methods we currently use to generate electricity with more sustainable ones, we will run out. Many experts estimate that we could run out of fossil fuels within the next 100 years, and burning other materials for energy, such as our own trash and trees, will only be able to take us so far.

Another reason why using renewable energy sources is so important is that all nonrenewable sources harm the planet when they're converted into energy, Polluting the air and making the world a more difficult place to live for plants, animals, and humans alike. Thus, it is important that we start to use renewable energy resources for avoiding this problem. Renewable energy is the energy that is replenished on a human timescale, but these Sources are flow-limited and we can harvest it by renewable resources, such as sunlight, the wind, hydropower, geothermal, tides and rains. Air pollutants and smog hanging over our cities cause allergies, symptoms of asthma, and even lung disease. Climate change, acid rain, and physical damage to the environment are also major negative impacts caused by our continued reliance on fossil fuels

The most popular renewable Energy sources currently are:

1. Solar energy
2. Wind energy
3. Hydro energy
4. Geothermal energy

Fig 1: Types of Renewable Energy

Benefits of Renewable Energy:

- Generating energy that produces no greenhouse gas emissions from fossil fuels and reduces some types of air pollution.
- Diversifying energy supply and reducing dependence on imported fuels.
- Creating economic development and jobs in manufacturing, installation.

This benefit is an obvious one; renewable energy comes from clean, green sources. Most emission that contribute to global warming, where fossil fuels are used to generate power.

Which contribute to global warming, climate change and degradation of air quality. Renewable energy sources release minimal to zero greenhouse emissions, helping to slow global warming and keep our environment cleaner for longer.

1) Solar energy:

Fig 2: Solar Energy

Sunlight is one of our planet's most abundant and freely available energy resources. The amount of solar energy that reaches the earth's surface in one hour is more than the planet's total energy requirements for a whole year. Although it sounds like a perfect renewable energy source, the amount of solar energy we can use varies according to the time of day and the season of the year as well as geographical location. In the UK, solar energy is an increasingly popular way to supplement your energy usage.

Solar energy is the energy obtained by capturing heat and light from the Sun. Energy from the Sun is referred to as solar energy. Technology has provided a number of ways to utilize this abundant resource. It is considered a green technology because it does not emit greenhouse gases. Solar energy is abundantly available and has been utilized since long both as electricity and as a source of heat.

- **Active Solar** − Active solar techniques include the use of photovoltaic systems, concentrated solar power and solar water heating to harness the energy. Active solar is directly consumed in activities such as drying clothes and warming of air.
- **Passive Solar** − Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light-dispersing properties, and designing spaces that naturally circulate air

Advantages of Solar Energy	Disadvantages of Solar Energy
Renewable Energy Source	Cost
Reduces Electricity Bills	Weather Dependent
Diverse Applications	Solar Energy Storage is Expensive
Low Maintenance Costs	Uses a Lot of Space
Technology Development	Associated with Pollution
Its sustainable	

- **working of Solar Energy :**

Solar power is harnessed using Solar Photovoltaic (PV) technology that converts sunlight (Solar radiation) into electricity by using semiconductors. When the sun hits the semiconductor within the PV cell, electrons are freed and bus bars collect the running electrons which results in electric current.

When we place Solar panels connected in a calculated manner in the sunlight, they start producing current and voltage in the form of Direct current (DC) but in most of the countries in the world appliances and equipment runs on Alternative current (AC) so we need to connect to all Solar panels to an Inverter which then converts DC into AC for home use.

Within each solar cell is a thin semiconductor wafer made from two layers of silicon. One layer is positively charged, and the other negatively charged, forming an electric field. When light energy from the sun strikes a photovoltaic solar cell, it energizes the cell and causes electrons to 'come loose' from atoms within the semiconductor wafer. Those loose electrons are set into motion by the electric field surrounding the wafer, and this motion creates an electrical current.

Form of photons, is absorbed, knocking loose a number of electrons, which then drift freely in the cell.

2) Wind Energy:

Fig 3: Wind Energy

In ancient times, wind was used to move the sails of the ships. In this chapter, we will see how wind energy is used to generate electricity.

Wind is a plentiful source of clean energy. Wind farms are an increasingly familiar sight in the UK with wind power making an ever-increasing contribution to the National Grid. To harness electricity from wind energy, turbines are used to drive generators which then feed electricity into the National Grid. Although domestic or 'off-grid' generation systems are available, not every property is suitable for a domestic wind turbine. Find out more about wind energy on our wind power page.

A turbine converts the kinetic energy of the wind to useful mechanical energy. This energy could be used in mechanical form or turn generator turbines and provide electricity. Just like in the hydropower systems, wind energy is harnessed through conversion of the wind kinetic energy to mechanical energy.

The wind turbines are largely classified into two types- Horizontal Axis Wind Turbines and Vertical Axis Wind Turbines. Large areas installed with wind turbines, that is, wind farms are increasingly emerging today.

Wind energy produced, especially in the horizontal axis type, is known to be the product of tip speed, the total number of blades used and the lift-to-drag ratio of the side with an aerofoil. The readjustment to a new steady state of equilibrium is well explained by the Dynamic Inflow Method (DIM).

DIM is also known as dynamic wake theory and is based on the induced flow, which is normally not steady. Taking into consideration its effect on the dynamic flow.

- **working of Wind Energy :**

Wind turbines work on a simple principle: instead of using electricity to make wind—like a fan—wind turbines use wind to make electricity. Wind turns the propeller-like blades of a turbine around a rotor, which spins a generator, which creates electricity.

A wind turbine turns wind energy into electricity using the aerodynamic force from the rotor blades, which work like an airplane wing or helicopter rotor blade.

When wind flows across the blade, the air pressure on one side of the blade decreases. The difference in air pressure across the two sides of the blade creates both lift and drag.

The force of the lift is stronger than the drag and this causes the rotor to spin. The rotor connects to the generator, either directly (if it's a direct drive turbine) or through a shaft and a series of gears (a gearbox) that speed up the rotation and allow for a physically smaller generator. This translation of aerodynamic force to rotation of a generator creates electricity.

The terms "wind energy" and "wind power" both describe the process by which the wind is used to generate mechanical power or electricity.

Advantages of Wind Energy	Disadvantages of Wind Energy
It Reduces Fossil Fuel Consumption	Wind Turbines Pose a Threat to Wildlife
Wind Energy Can Provide Power to Remote Locations	Wind Turbines Are Noisy
Wind Turbines Are Low Maintenance	The Wind Fluctuates
Wind Energy Has Low Running Costs	Wind Turbines Are Expensive
The Wind Energy Industry Creates Jobs	

3) Hydro energy:

Fig 4: Hydro Energy

As a renewable energy resource, hydro power is one of the most commercially developed. By building a dam or barrier, a large reservoir can be used to create a controlled flow of water that will drive a turbine, generating electricity. This energy source can often be more reliable than solar or wind power (especially if it's tidal rather than river) and also allows electricity to be stored for use when demand reaches a peak. Like wind energy, in certain situations hydro can be more viable as a commercial energy source (dependent on type and compared to other sources of energy) but depending very much on the type of property, it can be used for domestic, 'off-grid' generation. Find out more by visiting our hydro power page.

Hydro Electric power (HEP) is a major renewable energy source used all over the world today to produce electricity. It utilizes the basic laws of Physics. Falling water under high pressure has high kinetic energy. In an HEP station, the falling water turns the turbines. Through magnetic induction, the generator converts the mechanical energy of the turbines to electricity.

It is the technique of using dam water falling from a height to turn the turbines of a generator. The mechanical energy is converted into electrical form and fed into the national grid system.

The location of a hydroelectric power station must be analyzed by an expert to determine the effective head for maximum efficiency. Hydraulic systems are also used to utilize the concept on slower and slow moving water streams.

- **working of Hydro Energy :**

Hydroelectric power is generated using flowing water to spin a turbine which turns a shaft that's connected to an electric generator. ... The bigger the elevation and the more water that flows through the turbine, the greater the capacity for electricity generation.

Most hydroelectric power comes from the potential energy of dammed water driving a water turbine and generator. The power extracted from the water depends on the volume and on the difference in height between the source and the water's outflow. This height difference is called the head.

At hydropower plants water flows through a pipe, or penstock, then pushes against and turns blades in a turbine to spin a generator to produce electricity. Run-of-the-river systems, where the force of the river's current applies pressure on a turbine

Hydroelectric energy, also called Hydroelectric power or hydroelectricity, is a form of energy that harnesses the power of water in motion—such as water flowing over a waterfall—to generate electricity

Advantages of hydro Energy	Disadvantages of hydro Energy
Renewable energy source	Some adverse environmental impact
Pairs well with other renewable	Expensive up-front
Can meet peak electricity demand	Lack of available reservoirs

4) Geothermal energy:

Fig 5 : Geothermal Energy

By harnessing the natural heat below the earth's surface, geothermal energy can be used to heat homes directly or to generate electricity. Although it harnesses a power directly below our feet, geothermal energy is of negligible importance in the UK compared to countries such as Iceland, where geothermal heat is much more freely available.

Geothermal energy refers to heat energy stored under the ground for millions of years through the earth formation. It

utilizes a rich storage of unutilized thermal energy that exists under the earth's crust.

The presence of geothermal deposits in form of hot geothermal fluid is a sign of a good site. The site should have a shallow aquifer to allow injection of water. The inherent geothermal product should be about 300o F.

The principle is to use heat energy through heating of water to steam. Geothermal energy utilizes high temperatures below the earth's crust. The hot steam or water heats a fluid that in turn expands to turn turbines that generate electricity.

Geophysics specializes in finding resources under the earth's crust and determining the potential threats such as earthquakes. It also entails qualitative analysis to identify the best sites for mining, oil drilling and geothermal deposits.

- working of Geothermal Energy

The magma heats the water present inside the earth and increases its temperature greater than 182 degree Celsius. This hot water from the earth is piping to the surface of the earth through hot water wells. The steam from the hot water is separated and made it to strike on the turbine blade and it starts rotating. And produces electricity.

In dry steam power plant, direct steam from the geothermal reservoir is used to turn the turbine and generator to produce electricity. The temperature of the geothermal steam needed in this plant is atleast 150 degreee Celsius.

At a geothermal power plant, wells are drilled 1 or 2 miles deep into the Earth to pump steam or hot water to the surface. .... The steam spins a turbine, which is connected to a generator that produces electricity

Heat from the earth can be used as an energy source in many ways, from large and complex power stations to small and relatively simple pumping systems. This heat energy, known as geothermal energy, can be found almost anywhere—as far away as remote deep wells in Indonesia and as close as the dirt in our backyards.

There are three types of geothermal power plant:

1. Dry steam power plant
2. Flash stem power plant
3. Binary cycle power plant

Advantages of Solar Energy	Disadvantages of Solar Energy
No Fuel used	Rare
No pollution	High cost
Minimum land occupied	

II. CONCLUSIONS

In the future, it is aimed that the main energy sources will become new and renewable energies. While the fossil fuels are inevitably running out, renewable are to be more important. They are effective in many areas such as continuous cost reductions, generating jobs, developing future industries and meeting energy and environmental targets.

Fossil fuels are still maintaining the largest portion of energy consumption and keep on their increasing trend all over the world. In this situation, environmental pollution is somehow inevitable, whereas the renewable energy plants do not directly contribute any.

The development and use of renewable energy will improve the energy security, environment, economy, mechanical manufacturing, construction, transportation and industry and also help to create new jobs. Energies of solar, wind and biomass can meet local energy demands and assist to improve the environmental protection. Current situation related to the energy demand encourages an enormous market for renewable energy. As predicted, the share of renewable in meeting global energy demand will grow to reach 12.4% in 2023.In the longer term, if the investments in the renewable technologies continue, renewable will have the potential to make significant contributions to energy needs. Further, there are several technologies that include biofuels, and fuel cells also can contribute to heat, transport and electricity markets. The share of fossil fuels in total primary energy supply is expected to include around 81% of total in 2023. By 2050, renewable energy will approximately account for 30% of energy structure in the world.These technologies could slash costs by up to 80 per cent, ensure energy savings by up to 30 per cent and help to slow global warming in the future. Thus, the countries could stay cost-effective and make sustainable progress. Defined as the art of understanding consumers and their needs.In order to use less and cleaner energy in power plants.

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