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Research Article

A Review on Renewable Energy Supply

Goutam Das, Sourav Kumar Das, Palash Pal
Electrical Engineering Department, Haldia Institute of Technology, India

ABSTRACT:

The rapid increase in energy consumption, particularly in recent decades, has sparked concerns that the world's petroleum and other resource supplies would be depleted in the near future. The massive usage of fossil fuels has resulted in observable environmental devastation in a variety of ways. Fossil fuels account for almost 90% of total energy usage. The economy and technologies today are heavily reliant on natural resources, which are not replaced, as a result of industrialization and population expansion. Further, on the view of energy efficient system the renewable energy is highly appreciated in future time.

Keywords *- Renewable energy, sustainability, solar energy, wind energy, bio-mass energy, tidal energy, geothermal energy.*

I. INTRODUCTION

Renewable energy resources are globally abundant and many generation technologies are proposed to harness these resources for the production of electricity. Some of these technologies, such as wind, are in a full deployment stage and others such as concentrating photovoltaic and wave energy are still in the development stage. On a theoretical basis, the worldwide renewable resource base could satisfy global demand for energy services many times over, yet the promise of renewables remains unrealized. Non-hydropower renewable generating accounts for just approximately 2-3 percent of total electricity generation worldwide and in the all developed country. This share of renewable power is predicted to climb tenfold in the next 10-20 years. In the United States Coal, oil, and natural gas are currently the primary sources of energy [1].

Fossil fuels are non-renewable, meaning they rely on finite resources that will eventually deplete, making recovery prohibitively expensive or destructive to the environment. Every year, human activity releases around 8 billion metric tonnes of carbon into the atmosphere, with 6.5 billion

tonnes coming from fossil fuels and 1.5 billion coming from deforestation. The massive usage of fossil fuels has resulted in evident environmental devastation in numerous forms. It causes a slew of environmental issues, and our ecological cycle will be disrupted as a result. While continuing to look for new resources, the energy industry needs to gain more from existing fields. Vehicles with enhanced fuel efficiency and flawless hybrid vehicles are now available thanks to technical advancements. Improvements are also required so that wind, solar, and hydrogen can become more valuable energy sources. One advantage is that certain types of renewable energy supplies, such as wind and solar energy, are constantly renewed and will never run out. The sun provides the majority of renewable energy, either directly or indirectly. Solar energy, or sunlight, can be utilized directly to heat and light homes and other buildings, as well as to generate electricity, hot water heating, solar cooling, and a number of commercial and industrial applications. Another advantage of employing renewable resources is that they are scattered over a large geographical area, ensuring that emerging countries have access to energy generation at a steady cost in the long run. The sun's heat also drives the winds, the energy of which is harnessed by wind turbines. The water then evaporates as a result of the wind and heat from the sun. When this water vapour condenses into rain or snow and falls into rivers or streams, its energy can be collected using hydroelectric power. Plants grow as a result of sunlight, just as they do as a result of rain and snow. Biomass is the organic substance that makes up those plants. Biomass can be converted into power, transportation fuels, or chemicals. Bio energy is the use of biomass for any of these objectives [2-4].

Many organic molecules, as well as water, include hydrogen. It is the most plentiful element on the planet. However, it does not occur naturally as a gas. To form water, it is always coupled with additional elements, such as oxygen. Hydrogen, once separated from another element, can be used as a fuel or transformed into power. Not all renewable energy sources are derived from the sun. Geothermal energy harnesses the Earth's interior heat for a range of applications, including electric power generation and building heating and cooling. The energy of the ocean tides is derived from the moon's and sun's gravitational pull on the Earth. Actually, ocean energy originates from a variety of sources. There is also the energy of the ocean's waves, which are propelled by both the tides and the winds. The sun also heats the ocean's surface more than the depths, resulting in a temperature differential that may be utilized as an energy source. All of

these types of ocean energy may be employed to generate power [2].

II. RENEWABLE ENERGY BENEFITS AND EFFECTS ON THE GLOBAL ECONOMY

Renewable energy sources provide stable electricity and fuel diversity, which improves energy security, reduces the danger of fuel spills, and reduces the demand for imported fuels. Renewable energy also contributes to the conservation of the nation's natural resources.

A. Environmental Benefits

- Creating electricity from fossil fuels that emits no greenhouse gases and lowers some forms of air pollution
- Diversifying energy supplies and decreasing reliance on foreign fuels
- Economic development and employment creation in manufacturing, installation, and other fields

B. Price Stability

Renewable energy sources, such as wind, solar, hydro, and geothermal, do not require fuel or transportation, and hence provide more price stability. In reality, several utilities include this in their retail energy tariffs, exempting consumers who purchase renewables from some fuel-related expenses.

C. Jobs and the Economy

There are several career opportunities available in the sector, including work in production, installation, engineering, sales, marketing, and other areas. Renewable energy occupations are predicted to rise in the foreseeable future. Furthermore, renewable energy may boost commerce, lower the cost of fuel imports, motivate capital investment, and raise property tax income and landlord lease payments.

D. Energy Security

Energy efficiency has the potential to improve regional or national energy security. Efficiency may minimise dependency on oil, gas, and coal imports by lowering overall energy demand. As a result, energy efficiency may play a critical role in guaranteeing both long-term and short-term energy security while being cost-effective. [3].

III. AVAILABILITY OF RENEWABLE ENERGY RESOURCES

There are several career opportunities available in the sector, including work in production, installation, engineering, sales, marketing, and other areas. Renewable energy occupations are predicted to rise in the foreseeable future. Furthermore, renewable energy may boost commerce, lower the cost of fuel imports, motivate capital investment, and raise property tax income and landlord lease payments.

A. Solar Energy

Solar energy has the greatest promise for delivering clean, safe, and consistent power. The government provided solar energy subsidies to stimulate the use of solar energy. When a homeowner installs a solar panel array on his or her roof, he or she may be able to sell excess electricity to local utilities. Within the next decade, solar panels might be half the price, making solar-powered electricity competitive with existing fuel sources. Solar energy may be harnessed in three ways: photovoltaics, solar heating and cooling, and concentrating solar power. Photovoltaics employ an electrical method to create electricity directly from sunshine and may be used to power everything from small gadgets like calculators and traffic signs to residences and major commercial organizations. Solar heating and cooling (SHC) and concentrating solar power (CSP) applications both employ solar heat to provide space or water heating in the case of SHC systems, or to power typical electricity-generating turbines in the case of CSP power plants. There are few forms of solar energy. Passive solar energy is the capture of the sun's energy without the need of mechanical means. Active solar energy collects, stores, and distributes energy using mechanical devices [5].

Solar thermal energy is the energy produced by turning solar energy into heat. Photovoltaic solar power is the energy produced by converting solar energy into electricity. Concentrating solar power is a form of solar thermal energy that is used to produce solar power electricity. Only in buildings (or structures) is it feasible to utilize energy in an indirect manner (as shown in Fig. 1). Active solar energy is the use of the sun's electromagnetic radiation to create electrical energy. Semiconductor silicon Boron solar chips are often used in this application. The problem with these chips is that they have a low efficiency ratio and can only be used to fulfil the energy demands of small devices (such as calculators, watches, radios, and so on).

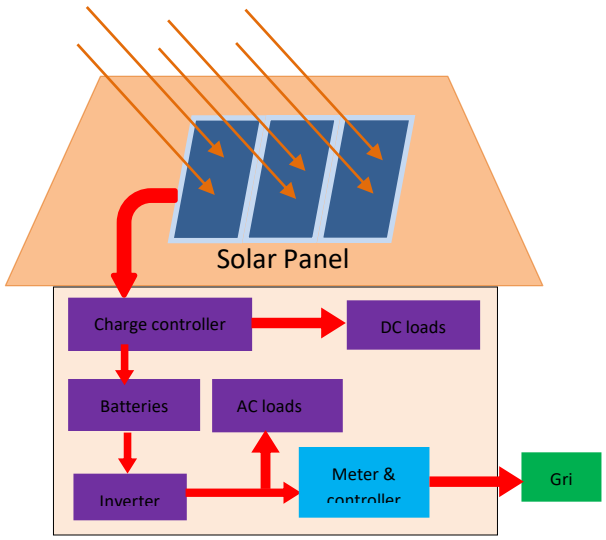

Fig. 1. Solar energy mechanism at the unit

B. *Hydro energy*

Hydropower, often known as hydroelectric power, is a renewable energy source that creates electricity by altering the natural flow of a river or other body of water using a dam or diversion construction. To generate electricity, hydropower uses the unending, continually replenishing mechanism of the water cycle, which uses a fuel—water—that is neither diminished or removed in the process. Hydropower plants come in a variety of shapes and sizes, but they are always driven by the kinetic energy of flowing water as it travels downstream. Hydropower facilities are frequently placed on or near a water source since it utilizes water to create energy. The amount of energy available from moving water is determined by the volume of water flowing as well as the change in elevation (also known as the head) from one location to another. The more power that can be created, the larger the flow and the higher the head. Water runs via a pipe, also known as a penstock, at the plant level, spinning the blades of a turbine, which then spins a generator, which creates energy. This is how most traditional hydroelectric plants work, including run-of-the-river and pumped storage systems. In terms of electricity supply, hydro power plants are generally steady throughout time. The flow is not on the scale of tens of thousands of times per second and may be accurately predicted in advance. Water can be retained in part, which can subsequently be used to control the electrical system during

intermediate and peak power usage. The fact that the most ideal and economically effective locations for hydro power plants have already been occupied poses a difficulty for future growth.

C. *Wind Energy*

Wind, which is ultimately powered by atmospheric air, is simply another method of gathering energy. The sun also warms the atmosphere, which causes wind to blow. It also operates on overcast days and during the rainy season. The placement of wind turbines is a critical aspect that determines the machine's performance. Windmills are often positioned at the top of a tower, reaching heights of roughly 30 m. It is situated at 5-15 times the diameter of the blades to minimize turbulence from one turbine impacting the wind flow at others. Windmills operate on both the horizontal and vertical axes.

The two systems' core mechanics are similar. Wind flowing over the blades is turned into mechanical power, which is delivered into an electrical generator through transmission. Wind turbines cannot operate in winds less than 13 km/h. They perform best in areas where the wind speed averages 22 km/h. The bulk of wind turbines manufactured nowadays are horizontal axis turbines with three blades about 15-30 m in diameter and providing 50-350 Kw of electricity. Wind energy does not pollute the air or water, does not contain poisonous or dangerous compounds, and does not endanger public safety.

D. *Biomass Energy*

Biomass is the most major source of agricultural energy generation. In a nation like India, where nature provides numerous forms of biomass, effective bio-energy harvesting may power whole rural milieus. This energy is also present in biodegradable trash, which is the rejected component of accessible biomass [5]. The term "biomass energy" refers to fuels derived from plant and animal waste. Organic stuff in which the energy of sunlight is stored in chemical bonds is referred to as biomass. When the bonds between carbon, hydrogen, and oxygen molecules are broken by digestion, combustion, or decomposition, stored energy is released. When organic matter is transformed to energy, biomass energy is produced. Heat is used in alcohol fermentation to transform starch in organic materials to sugar.

This sugar is subsequently fermented, and ethanol is distilled before being combined with another fuel. Aerobic digestion is a process that transforms biomass, particularly waste products

such as municipal solid waste and market trash. In this process, facultative bacteria break down organic matter in the absence of oxygen, producing methane and carbon dioxide. Bioconversion is a low-polluting, ecologically friendly, and cost-effective technique [8]. The wastewater and digester wastes are high in nitrogen and phosphate and can be returned to the soil as fertilizer [7]. Using this strategy, we can obtain 70% of the energy.

The biomass is combined with water before being kept in an airtight tank. Organic trash (Municipal Solid Waste) is collected separately, dried naturally, and shredded to a maximum particle size of 2–4 mm. This was maintained in a plastic container at room temperature, characterized, and utilized during the whole anaerobic digestion procedure. Before disposal, domestic sewage was collected from a college campus. It was utilized to dilute the feedstock in all anaerobic digestion experiments to attain the appropriate total solids concentration for the current inquiry. Experiments were carried out in a batch type reactor with a capacity of 5 liters that operated in semi-continuous mode with daily feeding. The digester was run at room temperature for 25 days with a constant hydraulic retention time and a variable organic input rate. To begin, the digester was charged with 2.75 liters of feed stocks (2 percent TS) and 2 liters of feed sludge. The digester was kept anaerobically, and stabilization was scheduled for two weeks. Sodium hydroxide was used to keep the pH between 6.5 and 7.5 during the stabilization stage. Every day, the pH and gas production were monitored. At the optimal organic loading rate of 2.9 kilograms of VS / m3/d, the highest biogas output is 0.36m3/kg of VS added/day.

In Chennai, the government built a power plant that runs on vegetable waste as fuel. The power plant will consume 40 tonnes of market garbage every day. The power station will produce around 4800 units of energy per day. The gas, which is composed of 65 percent methane and 35 percent carbon dioxide, is transported into a gasholder, where it is converted into electrical energy. The plant's power would be sold at a rate of Rs.3.15 per unit.

E. Tidal Power

Two-thirds of the Earth's surface is covered by oceans. This water is a tremendous source of renewable energy. India is naturally placed on the beach and is surrounded by water on three sides. The passage of water down the shore generates kinetic energy, which may be transformed into electrical energy. The energy is spread out throughout thousands of kilometers of coastline, and in good locations, the energy density can average 65 MW/mile of shoreline, which can lead

to cost-effective wave produced electricity [3]. The oscillating water columns employ the force of waves entering a stationary device to create electricity, which is the cheapest technique of drawing tidal power. The waves that enter the moored pipe compress the air in a vertical pipe. This compressed air may be utilized to power a turbine generator, which generates electricity. The primary issue with wave power facilities is cyclones and heavy storms. During this time, the facility is not operational.

F. Geothermal Energy

The heat from the Earth is referred to as geothermal energy. It's environmentally friendly and long-lasting. Geothermal energy resources span from shallow ground to hot water and hot rock found a few miles beneath the Earth's surface, and even deeper to extremely high temperatures of molten rock known as magma.

Almost everywhere, the shallow ground or upper 10 feet of the Earth's surface is relatively constant between 50° and 60°F (10° and 16°C). To heat and cool buildings, geothermal heat pumps may tap into this resource. A geothermal heat pump system is made up of a heat pump, an air supply system (ductwork), and a heat exchanger—a network of pipes buried in the shallow ground around the structure. The heat pump extracts heat from the heat exchanger and pumps it into the indoor air delivery system during the winter. In the summer, the process is reversed, and the heat pump draws heat from the inside air and transfers it to the heat exchanger. During the summer, the heat taken from the inside air may also be utilized to offer a free source of hot water [6].

IV. ENVIRONMENTAL PROBLEMS IN NON-RENEWABLE ENERGY RESOURCES

Coal, oil, and natural gas are fossil fuels that result from the breakdown of organic materials in or on the Earth. In terms of CO_2 emissions per unit of energy generated, coal is the worst offender among fossil fuels. Coal is used to create 20% to 30% of the energy in industrialized countries. Petroleum is made up of organic compounds that have accumulated in sediments. It causes acid rain by emitting Sulphur and carbon monoxide. Natural gas is a combination of methane and other hydrocarbons that may be ignited. The corrosive nature of methane is well known. Following gaseous contaminants in the atmosphere are produced by fossil fuels.

A. Carbon Dioxide

Carbon dioxide is the primary cause of global warming, accounting for 55% of the total. The main sources are fossil fuel burning (77%) and deforestation (23%). Carbon dioxide in the atmosphere has already changed the earth by roughly 30%. The average global temperature might rise by 1-5 degrees Celsius as a result of this. Every year, the average global surface temperature rises by 0.3-0.6 degrees Celsius. Acid rain is caused by nitrogen oxides, which account for around 35% of the total. Methane is responsible for around 20% of the global warming effect. This is usually released through coal combustion and natural gas leakage, natural gas used in oil production, and petrol spills. The cooling water from thermal power plants is released into rivers (or) lakes. The temperature of the water body rises quickly, and it loses its oxygen-holding capacity, resulting in a reduction in dissolved oxygen, which has a direct impact on aquatic life [7].

V. RENEWABLE ENERGY CONDITION IN INDIA

India is the second most populated country in the world. here the flow between energy supply and demand is noticeable, and demand for renewable energy is also very strong. depending on the economic growth and energy demand, India faces energy shortages as well as external energy dependence and along with the energy security issues have become gradually significant. As demand is constantly increasing therefore the supply of renewable energy has to be increased proportionally to fulfill the demand. Fossil energy is still in an absolutely leading position in the energy structure of India, whereas coal has been above 50% for a long time. The production of coal, oil and natural gas has been lowering them the corresponding consumption rate. For that reason, renewable energy has need to maintained rapidly.

One positive point, according to sources, is that India is the world's seventh largest hydropower generator, with a significant hydropower installed capacity of 45.29 GW in 2017. India's Biomass resources are also highly abundant due to its benefits. Biomass generation report for 2017. 8.4 GW of electricity was generated by gasification and combined heat and power. However, the spread of renewable energy in India remains insufficient. However, in comparison to traditional energy, which continues to rise rapidly, the development of renewable energy must be bolstered with a rapid increase in 2-3 energy usage. Bloomberg predicts that by 2050, will account for 75 percent of the market. With limited available technology and economic considerations, it is difficult to capture and store renewable energy when we have plenty in an

area where others must focus. The presence of oil and a lack of environmental awareness are the causes. As well as a few investments in renewable energy.

Hydropower dams and reservoirs (LIMITED) are two kinds of renewable energy in India. Solar energy for street lighting (as seen in Fig. 3 below). And wind power projects are being implemented, but only in a few locations, depending on wind availability, and these sites are located on the west, south, and north-west sides of the nation, as well as in coastal areas (particular space in India) [8].

Fig. 2. Solar energy uses in India

V. ECONOMICAL BENEFITS

The lack of availability at a fair cost, restricted supply, and lack of affordability are all issues with renewable energy sources. Capturing and concentrating renewable energy is a viable option. The country's economy will grow if effective actions to remove these fossil fuel (oil and natural gas) imports are taken [8]. Subsidies lower the cost of producing renewable energy. For several years, the World Bank has been selling electricity in poor nations for a cost of only 40% of its production cost. The government can lower prices by offering subsidies in the form of decreased customs, taxes, and installation fees, bringing them closer to the rate of fossil fuels [7].

A. World Energy Conservation

Predicted estimation about the rate of utilization of energy resources shows that the coal deposits will deplete within the next 200 to 300 years and petroleum deposits will deplete in next few decades. Now, the world is looking for alternate energy resources. Hence, it is necessary to encourage and emphasize the research and development activities covering abroad spectrum of possible renewable resources, as their contributions are substantial. There is no depletion of

renewable energy sources. Natural processes quickly replenish these supplies. It will not pollute the environment in any way. The fundamental benefit of adopting renewable resources is that they are available all year. We can draw energy for many decades without harming the environment by making a one-time investment. Our country's economy has grown as a result of the successful use of renewable energy sources [1].

V. CONCLUSION

Some nations' energy efficiency and pollution reduction methods, such as good transportation system management, have grown popular. The nations studied are assisting the environment on various dimensions, from include environmental and climatic concerns in national policies to declaring environmental protection a national goal. The necessity of increasing public knowledge of environmental and climatic change has been recognized globally. Renewable energy sources are a potential alternative to fossil fuels since they are both cost-effective and user-friendly. By expanding renewable energy sources, we may prevent air pollution, soil contamination, and water pollution. The country's economy will expand. These resources are available throughout the year and do not hurt the environment.

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