

Multiple forms of renewable energy

N. Y. Tanisa, Rabiul Awal, Shamima Mehrin, S. M. Shahid Hasan, Md. Sk Farid, Md. Fahad Bin Islam Saif, Shajib Mian and Md Asaduzaman Talukder

Department of Physics, Uttara University, Uttara, Dhaka

*Corresponding author's mail address: tanisha.90@uttarauniversity.edu.bd

Abstract— There are worries that the world's oil as well as other energy reserves, particularly in recent decades, may soon exhaust itself. Several ways may be easily seen in which the environment has been affected by the widespread use of fossil fuels. The use of fossil fuels continues to dominate the world's energy mix. They are responsible for more than 80% of energy use. Due to industrialization and population growth, our economy and technology today are highly dependent on natural resources that cannot be replaced.

Index Terms— Solar energy, Sustainability, Wind energy, Ocean energy, Geothermal energy

1 INTRODUCTION

Bangladesh's primary energy sources are now coal, oil, and natural gas. Because fossil fuels are nonrenewable, companies eventually deplete their resources and become either too expensive or environmentally hazardous to extract. Around 800 million metric tons of carbon dioxide are released into the environment a year as a consequence of human activity, 6.5 billion from fossil fuels and 1.5 billion from deforestation [1]. The massive usage of fossil fuels has resulted in observable environmental devastation in a variety of manifestations. It causes a slew of environmental issues, and our ecological cycle will suffer as a result. The energy business must extract more from existing areas while also searching for new resources. Cars with higher fuel efficiency and flawless hybrid cars are being produced as a result of technical improvement. Improvements also are required so that wind, sunlight, and hydrogen could become more attractive sources of energy. Another benefit of renewable energy supplies, such as solar and wind energy, is that they are continually renewed and will never run out. The benefit of adopting renewable energy sources is that they are regionally dispersed, allowing emerging regions to receive energy generation at stable prices over the long term. The amount of sunlight also propels the winds, the energy of which is collected by wind turbines. Water evaporates as a result of the wind and heat from the sun. When this water vapor condenses into rain or snow and falls into rivers or streams, the energy it contains may be collected using hydroelectric power. Biomass is organic, which means it is composed of material derived from living organisms such as plants and animals. Plants, wood, and garbage are the most frequent biomass sources utilized for energy. These are referred to as biomass feedstocks. Biomass energy could also be a nonrenewable source of energy. Hydrogen, the most plentiful element in the cosmos, is also a viable source of "clean" energy on Earth. Hydrogen fuel combines with oxygen from the air through a fuel cell, creating electricity and water through an electrochemical process. Renewable energy sources do not all originate from the sun. Steam is used in geothermal power

plants to create energy. The hot water reservoirs that produce the steam can be found many miles or more below the surface of the planet. Steam causes a turbine to spin, which ignites a generator and generates power. All renewable energy sources that come from the water are referred to as ocean energy. Wave, tidal, and ocean thermal technologies are the three primary categories of ocean technology. The commercialization of ocean energy in all its forms is still in its early stages.

2.1 THE VALUE OF RENEWABLE ENERGY

- A. Creating electricity from fossil fuels that emit no greenhouse gases and lower some forms of air pollution.
- B. Trying to diversify energy supplies and decreasing reliance on foreign fuels.
- C. Economic development and employment creation in manufacturing, installation, and other fields.
- D. Although renewable facilities require upfront investments to build, they can then operate at a very low cost (for most clean energy technologies, the "fuel" is free). As a result, renewable energy prices can be very stable over time. [2].
- E. Renewable energy can meet two-thirds of total global energy demand and contribute to the majority of greenhouse gas emission reductions required between now and 2050 to keep the average global surface temperature rise below 2 degrees Celsius [3].

2.2 Renewable Energy Types

- A. **Solar Energy:** Solar energy is the use of the Sun's radiant light and heat to create electricity, solar thermal energy (including solar water heating), and solar architecture [4, 5]. It's an important source of renewable energy, and its methods are roughly classified as either passive solar or active solar, depending on how they absorb, distribute, or convert

solar radiation into solar power. To harness the energy, active solar approaches such as photovoltaic systems, concentrated solar power, and solar water heating are used. Orienting a structure to the Sun, selecting materials with favorable thermal mass or light-dispersing qualities, and creating rooms that naturally circulate air are all examples of passive solar approaches. Subsidies were provided by the government to encourage the use of solar electricity. A homeowner who puts a solar panel array on their home can sell excess energy to local utilities. Solar panel costs might be decreased by half within the next decade, making solar-powered electricity costs competitive with other sources of fuel [6]. There are two methods for capturing solar energy. Passive systems are structuring whose design, siting, or materials maximize the utilization of direct solar heat or light. Active systems are devices that transform solar energy into usable forms such as hot water or power. Passive solar refers to the use of the sun's energy for heating and lighting a building without the use of active mechanical systems. Fig.1. shows the schematic diagram of a home solar system. It utilizes design features such as orientation, shading, and thermal mass to optimize the natural flow of heat and light into a building, reducing the need for heating and cooling systems and providing cost savings in energy consumption. Active solar refers to a system in which solar panels, pumps, fans, or other mechanical devices are used to actively collect and convert sunlight into usable energy, such as electricity or hot water. This is in contrast to passive solar systems, which rely on the sun's heat to warm a building or to provide natural light without the use of mechanical devices. Active solar systems are typically more efficient and require a greater initial investment, but they also provide more consistent and reliable energy production.

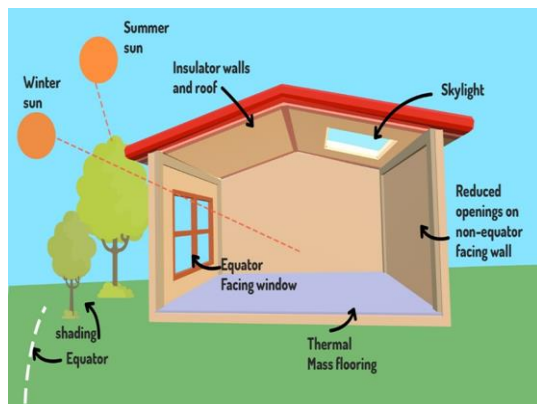


Fig.1. The schematic diagram of home solar

B. Wind Energy

Wind energy is a form of renewable energy that is harnessed by using wind turbines and other wind-capturing technologies to convert the kinetic energy of the wind into electricity. Wind turbines are typically mounted on tall towers to maximize their exposure to the wind and to increase the amount of energy they can generate.

Fig. 2. Shows the schematic diagram of wind energy. Wind energy is one of the most cost-effective forms of renewable energy and can be used to power homes, businesses, and entire communities.

Types of wind energy

1. Horizontal Axis Wind Turbines: These are the most common type of wind turbine, typically seen in wind farms. A rotor with three blades is mounted on a tower and spins in the wind, generating electricity.
2. Vertical Axis Wind Turbines: These turbines have blades that rotate on a vertical axis, allowing them to capture wind from any direction. They are typically used in urban areas and are quieter than horizontal axis turbines.
3. Offshore Wind Turbines: These turbines are mounted in the ocean and have the potential to generate large amounts of electricity. They are more expensive to install and maintain than other types of turbines.
4. Hybrid Wind Turbines: These turbines combine the technologies of horizontal and vertical axis turbines, allowing them to generate more electricity and operate more efficiently.
5. Small Wind Turbines: These turbines are used to generate electricity for homes and businesses. They are typically mounted on rooftops or poles and generate a small amount of electricity.

Wind energy can be used to generate electricity in a variety of ways. Wind turbines can be used to convert the kinetic energy of the wind into mechanical or electrical energy. Wind turbines can be used in residential, commercial, or industrial settings to generate electricity. Wind energy can also be used to pump water, grind grain, and power sailboats. In addition, wind energy can be used to power wind-powered vehicles and provide electricity for remote locations.

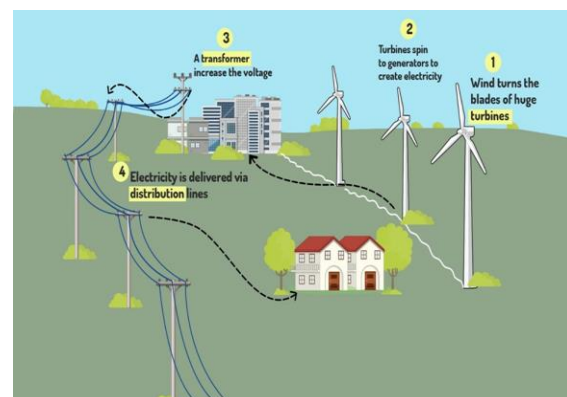


Fig. 2. The schematic diagram of wind energy

C. Geothermal Energy:

Geothermal energy is one kind of renewable energy. it is the thermal energy in the Earth's crust that results from the planet's formation and the radioactive decay of materials. The heat that rises from the earth's

interior is known as geothermal energy [7]. It can be found as deep as the heated, molten rock, or magma, that makes up the earth's crust in the rocks and fluids there. Geothermal energy has so many advantages. First of all, Geothermal energy is very cheaper compared to any other energy. Secondly, geothermal energy resources are constantly available. Thirdly, an important portion of the global electricity demand can be supplied by geothermal energy. also, satisfy the demand for 90% heating in some cold countries such as Iceland. Fourthly, there is no need for fuel since geothermal energy is a naturally existing supply [8]. Fifth, Geothermal energy is environmentally friendly, because it produces very less carbon dioxide. Geothermal energy is very low-cost, environmentally friendly, and sustainable. Therefore, it has a few disadvantages. Fig. 3. Shows the schematic diagram of geothermal energy. Firstly, Geothermal energy has been linked to other emissions such as SO₂ and H₂S despite producing little CO₂. Secondly, the biggest disadvantage of geothermal energy is its specific location. So, it is not possible to build geothermal plants everywhere. Thirdly, though it is a very low-cost energy resource the setup and maintenance of the geothermal plant are so expensive. Fourthly, geothermal energy bears the risk of causing earthquakes [9].

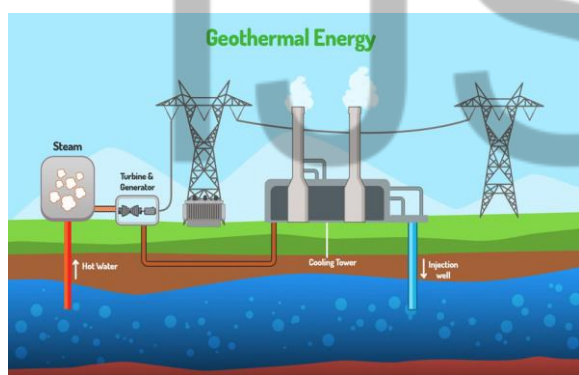


Fig. 3. The schematic diagram of geothermal energy

D. Ocean Energy:

Ocean energy refers to all forms of renewable energy derived from the sea. There are three main types of ocean technology: wave, tidal, and ocean thermal. All forms of energy from the ocean are still at an early stage of commercialization. Wave energy remains more costly than other ocean technologies. Tidal range (see explanation below) has been deployed in locations globally where there is a strong tidal resource (for example La Rance in France, Sihwa in South Korea), while tidal stream (see below) has been demonstrated at pilot scale. Wave energy is generated by converting the energy within ocean waves (swells) into electricity. There are many different wave energy technologies being developed and trialed to convert wave energy

into electricity. Fig. 4. Shows the schematic diagram of ocean energy. Tidal energy comes in two forms, both of which generate electricity:

- Tidal range technologies harvest the potential energy created by the height difference between high and low tides. Barrages (dams) harvest tidal energy from different ranges.
- Tidal stream (or current) technologies capture the kinetic energy of currents flowing in and out of tidal areas (such as seashores). Tidal stream devices operate in arrays, similar to wind turbines.

Ocean thermal energy is generated by converting the temperature difference between the ocean's surface water and deeper water into energy. Ocean thermal energy conversion (OTEC) plants may be land-based as well as floating or grazing [10].

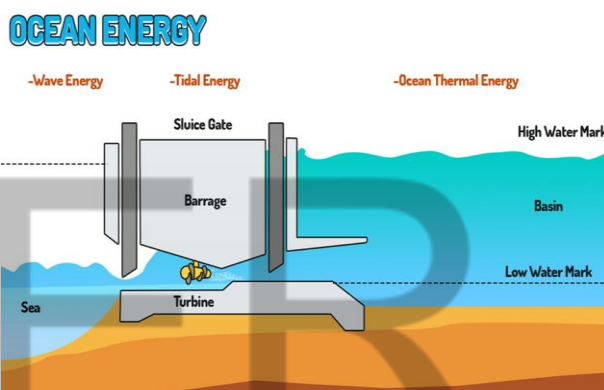


Fig. 4. The schematic diagram of ocean energy

3 The benefits of renewable energy in Bangladesh

Using clean energy solutions (renewables and energy efficiency), which not only cut greenhouse gas emissions but also boost jobs and enhance human health by lowering air pollution, it is possible to expand capacity in the electrical industry cost-effectively. According to a report from the Low Emission Development Strategies Global Partnership (LEDS GP) and based on a thorough modeling analysis, Bangladesh's power generation mix would benefit from more clean energy in comparison to "business as usual" if the following cumulative effects were to occur by 2030:

- i. reduce greenhouse gas emissions by up to 20% and generate domestic employment of up to 55,000 full-time equivalent jobs.
- ii. Potential to produce additional electricity of 30 GW [11] from the utilization of solar PV and 53 gigawatts (GW) [12] of electricity potential from all solar sources.
- iii. save up to 27,000 lives, and over US\$5 billion (BDT 420 billion) [13].

3. Discussion

1. Energy sources used by nations across the world include coal, natural gas, and petroleum. Energy sources come in two categories: renewable and nonrenewable. Fossil fuels and hydrocarbons are nonrenewable energy sources. Very serious issues arise from reliance on them. Secondly, because fossil fuels like oil, coal, and gas are limited energy sources, they will ultimately exhaust. Second, they will become excessively costly and environmentally harmful in the ensuing decades. Thirdly, using fossil fuels directly damages the ecosystem, which contributes to global warming. Renewable energy sources, on the other hand, including wind and solar energy, are continuously and organically supplied and never run out.
2. During the coming few decades, the age of oil and natural gas would shortly come to an end. A global ecological catastrophe is being caused by the extensive combustion of the world's coal reserves. The most carbon dioxide is released into the atmosphere when coal is burned. So, the only option available to humanity is the widespread usage of renewable energy in the years to come.
3. adequate to handle the world's future energy concerns. As a result, major industrial coun-

tries have taken measures to utilize alternative energy sources, namely green or renewable energy sources. The discussion's conclusion reflects humanity's worry in the twenty-first century.

End Sections

4. CONCLUSION

Renewable energy sources are less expensive and easier to utilize than fossil fuels. We can avoid air pollution, soil contamination, and water pollution by boosting renewable energy sources. The economy of the country will grow. These sources are available all year without harming the environment.

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COAL, NATURAL GAS, AND PETROLEUM. ENERGY SOURCES COME IN TWO CATEGORIES: RENEWABLE AND NONRENEWABLE. FOSSIL FUELS AND HYDROCARBONS ARE NONRENEWABLE ENERGY SOURCES. VERY SERIOUS ISSUES ARISE FROM RELIANCE ON THEM. SECONDLY, BECAUSE FOSSIL FUELS LIKE OIL, COAL, AND GAS ARE LIMITED ENERGY SOURCES, THEY WILL ULTIMATELY EXHAUST. SECOND, THEY WILL BECOME EXCESSIVELY COSTLY AND ENVIRONMENTALLY HARMFUL IN THE ENSUING DECADES. THIRDLY, USING FOSSIL FUELS DIRECTLY DAMAGES THE ECOSYSTEM, WHICH CONTRIBUTES TO GLOBAL WARMING. RENEWABLE ENERGY SOURCES, ON THE OTHER HAND, INCLUDING WIND AND SOLAR ENERGY, ARE CONTINUOUSLY AND ORGANICALLY SUPPLIED AND NEVER RUN OUT.

DURING THE COMING FEW DECADES, THE AGE OF OIL AND NATURAL GAS WOULD SHORTLY COME TO AN END. A GLOBAL ECOLOGICAL CATASTROPHE IS BEING CAUSED BY THE EXTENSIVE COMBUSTION OF THE WORLD'S COAL RESERVES. THE MOST CARBON DIOXIDE IS RELEASED INTO THE ATMOSPHERE WHEN COAL IS BURNED. SO, THE ONLY OPTION AVAILABLE TO

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