

# Alternative Energy Sources and Green Technology

Vishav Singh<sup>1</sup>, Kiranjit Kaur<sup>2</sup>

<sup>1</sup>M. Tech Student, Department of Electrical Engineering, Desh Bhagat University, Mandi Gobindgarh, Punjab (147301)

<sup>2</sup>Assistant Professor, Department of Electrical Engineering, Desh Bhagat University, Mandi Gobindgarh, Punjab, (147301)

Corresponding Author Email ID: [vishavbandral1999@gmail.com](mailto:vishavbandral1999@gmail.com), [kiranjit10@deshbhagatuniversity.in](mailto:kiranjit10@deshbhagatuniversity.in)

## Abstract:

This paper presents a review of the green technologies and processes for the development of renewable energy resources. Renewable energy options show a lot of potential for fulfilling the world's energy and development demands. This promise is especially compelling in emerging nations, where many areas have yet to commit to fossil fuel supremacy. Solar photovoltaic and solar thermal technologies are especially helpful for supplying the two billion people living in rural regions who do not have access to power from the grid. Biomass energy is appealing because it makes use of locally accessible agricultural waste. Small hydroelectric resources and wind energy are also developed technologies that are well suited to develop countries. Renewable energy sources are significantly more cost-effective than traditional energy sources, particularly when the expenses of acquiring, maintaining, and running centralized power plants, as well as the costs of pollution remediation, are avoided. However, a slew of economic, societal, and legal roadblocks stand in the way of these renewable resources attaining their full potential.

**Keywords:-** Renewable Energy Resources, Green House Effect, Solar Energy, Generations of Technologies;

## 1. INTRODUCTION

Alternative energy (sometimes known as renewable energy) refers to a wide range of power generation options. Electricity obtained from renewable resources such as solar or wind energy, as opposed to single-use resources such as coal or uranium, is referred to as renewable energy. Solar power, wind power, and hydropower are the most prevalent kinds of alternative energy available to homeowners today. Nonrenewable energy sources were the primary energy sources in the twentieth century. These includes[1]

- Fossil fuels
- Coal
- Oil
- Natural gas
- Nuclear energy

Nonrenewable energy sources have two major drawbacks: limited supply and pollution. The combustion of fossil fuels produces a large amount of carbon dioxide (CO<sub>2</sub>), a greenhouse gas. This is most likely the primary cause of the recent rise in global temperatures. Nuclear power facilities, on the other hand, are not harmful to the environment, but the compounds formed as a result of nuclear reactions are radioactive for years and must be stored in specific chambers. Renewable energy sources, on the other hand, are unaffected by any of these issues. The following are the most important renewable energy sources:

- Wind energy
- Solar energy
- Bioenergy

## • Hydro energy

Renewable energy sources do not pollute the environment to the same extent that non-renewable do, but they are also not fully clean. This primarily affects biomass energy, which has the same effect as fossil fuels in terms of CO<sub>2</sub> emissions when burned, but the carbon circle is at least closed in that case. [2]

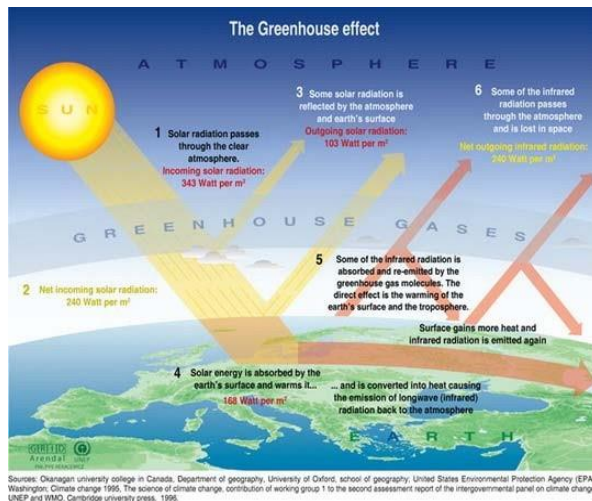


Fig. 1

The expense and small volume of renewable energy sources (water energy excluded) are the two biggest issues, of newly acquired energy Renewable energy sources have enormous promise, but our current technological advancement prevents us from solely relying on them. The "Greenhouse Effect" is seen in this image. The earth reflects some of the sun's reflected radiation as greenhouse gases (CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub>, HFC, PFC, and SF<sub>6</sub>), and this effect is responsible for Earth's temperatures. Due to the increasing concentration of CO<sub>2</sub> during the last century, greenhouse effects have been strengthening over the period[3]. As a result, the average temperature of the Earth rises globally. Ice melting, rising sea levels, agriculture impacts, and so on are all consequences of global warming. If the greenhouse effect did not exist, the earth's temperature would be approximately 30°C lower than it is now. Wood and biomass burning, deforestation, and fossil fuel combustion are all major producers of CO<sub>2</sub>.

## 2. GENERATIONS OF RENEWABLE ENERGY TECHNOLOGIES

Renewable energy encompasses a wide range of sources and technologies at various levels of development. The International Energy Agency (IEA) has identified three generations of renewable energy technology over the years:

Hydropower, biomass combustion, geothermal power, and heat are examples of first-generation technologies that emerged around the

end of the nineteenth century as a result of the industrial revolution. These technologies have a huge following. Second-generation technology includes solar heating and cooling, wind power, various types of biofuels, and solar photovoltaic. As a result of investments in research, development, and demonstration since the 1980s, they are now entering the market. Concerns about energy security following the oil crises of the 1970s prompted the initial investment, but these technologies' long-term appeal is due, at least in part, to environmental benefits. Many of the innovations are based on significant technological breakthroughs. Among the third-generation technologies still under development are advanced biomass gasification, biorefinery technologies, concentrated solar thermal power, hot-dry-rock geothermal power, and ocean energy. Nanotechnology breakthroughs have the potential to make a big impact.[4]

### 3. SOLAR HEATING

Solar heating systems are a well-known second-generation technology that consists of solar thermal collectors, a fluid system to transport the heat from the collector to the point of use, and a reservoir or tank to store the heat. Household hot water, swimming pools, and residential and commercial buildings may all benefit from these systems. The heat can also be used in industrial operations or as a source of energy for other applications, such as cooling.

### 4. BENEFITS OF RENEWABLE ENERGY

The following are some of the most significant advantages of renewable energy:

They are a renewable resource. It is one of the most significant advantages of alternative energy since renewable energy is always available for widespread usage and does not deplete like fossil fuels. The sun, wind, tides, and other natural forces will always be available for humans to use.

Municipal solid trash is being phased out. Alternative energy benefits include not only removing vast volumes of garbage now destroying the environment but also converting this junk into a benefit through waste to energy plants. These factories treat municipal waste, converting it to electricity and removing it from the environment.

Energy production on a small scale. Producing locally has several advantages in terms of alternative energy. This comprises decreasing transportation costs and benefits for local economies from the company putting up factories using alternative energy sources. It will no longer be necessary to import fossil fuels from other countries at exorbitant prices. There will be no need for foreign energy if there are several plants of alternative energy sources in the country.

Improved national security Alternative energy sources do not rely on foreign oil, which can be politically hostile to the United States at times. It also implies that foreign countries do not have control over the market, which is potentially volatile. Foreign dependency is completely reduced with alternative energy sources.

It is more environmentally friendly. One of the most significant advantages of alternative energy is that it is far more environmentally friendly than present fossil fuel use. Alternative energy sources do not emit carbon dioxide, and their recovery causes little or no environmental damage. Fossil fuels, such as gas and oil, emit large amounts of greenhouse gases, which contribute significantly to global warming.[5]

A future that is healthier and cleaner. Alternative energy sources

give solutions to the concerns of global warming, and they may repair some of the damage that has already been caused by the usage of fossil fuels. All of this contributes to making our planet a healthier and cleaner place to live for future generations. If we work together, we can Price stability has improved. Alternative energy has numerous advantages, including constant availability and sustainability, as well as being significantly less expensive and stable. For each area allocated to alternative energy sources, a mix of strategies is employed to keep energy costs from changing in the way that oil and gas prices do.



**Fig. 2**

This helps to keep the pricing of alternative energy sources steady and prevents market instability.

### 5. DISADVANTAGES OF ALTERNATIVE ENERGY

Alternate energy sources have the following disadvantages:

No Constant Supply. The energy supply is dependent on nature and, thus, is not constant, e.g., solar energy. The same may be said about wind energy. Wind farms can only generate power in the countryside or other such regions where turbines can receive wind without being obstructed. The situation is better with hydroelectricity (or water energy) because once power is created at the dams, it can be extracted through wires and sent across long distances.[6]

Implementation Problems This is one of the main reasons why alternative energy isn't popular. Alternative energy sources have been used by many industries. They, on the other hand, withdraw as soon as they realize it would be too expensive.

It is costly to use. In terms of cost, fossil fuels are less expensive to utilize than alternative energy. Fossil fuels are easily available, maybe stored anywhere, and can be transferred using standard transportation methods. Solar electricity is expensive to utilize in everyday life. The cost per KWH might range from 20 to 25 cents. Dependancy on Seasons. Biomass is generally produced from corn, wheat, barley, and similar crops all of which are seasonal. Thus biomass can only be produced only in certain seasons. Energy/Hydropower: Hydropower (water energy) often damages the surrounding environment. It has a well-known effect on fish. Many people consider hydropower plants to be ecological blight. Damming also reduces the amount of oxygen dissolved in the water. It would be erroneous to assert that alternative energy has no drawbacks.[7]

### 6. NON-TECHNICAL BARRIERS TO ACCEPTANCE

The main impediments to the broad commercialization of renewable energy technology are political rather than technical, and several studies have found a variety of non-technical hurdles to renewable energy use. The following are some of the most significant obstacles: Lack of government policy support, which includes the absence of policies and regulations that assist the deployment of renewable energy technology as well as the presence of rules and regulations that both impede and encourage renewable energy development. Subsidies for fossil fuels, a lack of

consumer-based renewable energy incentives, government insurance for nuclear plant accidents, and complicated renewable energy zoning and approval processes are just a few examples.[8] Consumer awareness and information transmission are lacking. Renewable energy technologies have a greater capital cost than traditional energy systems. Inadequate funding alternatives for renewable energy projects, including project developers, entrepreneurs, and consumers having insufficient access to reasonable finance. Failing to absorb all costs of conventional energy (e.g., consequences of air pollution, the danger of supply interruption) and failure to internalize all benefits of renewable energy are examples of imperfect capital markets (e.g., cleaner air, energy security). Lack of necessary scientific, technical, and manufacturing skills required for renewable energy generation; lack of dependable installation, maintenance, and inspection service and the inability of the educational system to give adequate training in new technologies. Codes, standards, utility connections, and net-metering rules are all lacking.[9] Poor public perception of renewable energy system aesthetics. Lack of stakeholder/community participation and co-operation in energy choices and renewable energy projects.

## 7. CONCLUSION

As the alternative energy industry grows and refines the available technology, the cost of renewable energy will decrease, and alternative power generators will become capable of supplying more power from less wind or sun, making them more reliable as a year-round power source. Over time, as fossil fuel resources become scarcer and environmental regulations become stricter, the cost of utility-supplied electricity and fuel oil will increase.[8] It's only a matter of time before alternative power sources present themselves as the only sensible. However, implying that fossil fuels are superior to alternative energy is incorrect. Alternative energy is becoming increasingly popular as people become more concerned about the environment. The downsides of alternative energy will gradually fade away as we adopt the benefits more into our daily lives.

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