



RENEWABLE ENERGY TECHNOLOGIES & BENEFITS OF RENEWABLE ENERGY USE

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ABSTRACT

The renewable energy resources are suited for the provision of rural power supplies and a major advantage is that energy is often crucial in human development. The move towards a de-carbonised world, driven partly by climate science and partly by the business opportunities it offers, will need the promotion of environmentally friendly alternatives, if an acceptable stabilization level of atmospheric carbon dioxide is to be achieved. This requires the harnessing and use of natural resources that produce no air pollution or greenhouse gases and provides comfortable coexistence of human, livestock, and plants. This article presents a comprehensive review of energy sources, and the development of sustainable technologies to explore these energy sources. It also explores the benefits of renewable energy savings in greenhouse environment.

Introduction

All energy sources have some impact on our environment. Renewable energy is energy generated from natural resources—such as **sunlight**, wind, rain, tides and **geothermal** heat—which are renewable (naturally replenished). Some of them are discussed in this paper. There are many forms of renewable energy. Most of these renewable energies depend in one way or another on sunlight. Wind and hydroelectric power are the direct result of differential heating of the Earth's surface which leads to air moving about (wind) and precipitation forming as the air is lifted. Solar energy is the direct conversion of sunlight using panels or collectors. Biomass energy is stored sunlight contained in plants. Other renewable energies that do not depend on sunlight are geothermal energy, which is a result of radioactive decay in the crust combined with the original heat of accreting the Earth, and tidal energy, which is a conversion of gravitational energy.

Solar Power: This form of energy relies on the nuclear fusion power from the core of the Sun. This energy can be collected and converted in a few different ways. The range is from solar water heating with solar collectors or attic cooling with solar attic fans for domestic use



to the complex technologies of direct conversion of sunlight to electrical energy using mirrors and boilers or photovoltaic cells. Unfortunately these are currently insufficient to fully power our modern society.

Like wind power, the sun provides a tremendous resource for generating clean and sustainable electricity. The environmental impacts associated with solar power can include land use and habitat loss, water use, and the use of hazardous materials in manufacturing, though the types of impacts vary greatly depending on the scale of the system and the technology used — photovoltaic (PV) solar cells or concentrating solar thermal plants (CSP). The sun provides a tremendous resource for generating clean and sustainable electricity without toxic pollution or global warming emissions.

Benefits:

Solar energy—power from the sun—is a vast and inexhaustible resource. Once a system is in place to convert it into useful energy, the fuel is free and will never be subject to the ups and downs of energy markets. Furthermore, it represents a clean alternative to the fossil fuels that currently pollute our air and water, threaten our public health, and contribute to global warming. Given the abundance and the appeal of solar energy, this resource is poised to play a prominent role in our energy future.

In the broadest sense, solar energy supports all life on Earth and is the basis for almost every form of energy we use. The sun makes plants grow, which can be burned as "biomass" fuel or, if left to rot in swamps and compressed underground for millions of years, in the form of coal and oil. Heat from the sun causes temperature differences between areas, producing wind that can power turbines. Water evaporates because of the sun, falls on high elevations, and rushes down to the sea, spinning hydroelectric turbines as it passes. But solar energy usually refers to ways the sun's energy can be used to directly generate heat, lighting, and electricity.

The amount of energy from the sun that falls on Earth's surface is enormous. All the energy stored in Earth's reserves of coal, oil, and natural gas is matched by the energy from just 20 days of sunshine. Outside Earth's atmosphere, the sun's energy contains about 1,300 watts per square meter. About one-third of this light is reflected back into space, and some is absorbed by the atmosphere.



By the time it reaches Earth's surface, the energy in sunlight has fallen to about 1,000 watts per square meter at noon on a cloudless day. Averaged over the entire surface of the planet, 24 hours per day for a year, each square meter collects the approximate energy equivalent of almost a barrel of oil each year, or 4.2 kilowatt-hours of energy every day. Deserts, with very dry air and little cloud cover, receive the most sun—more than six kilowatt-hours per day per square meter. Northern climates, such as Boston, get closer to 3.6 kilowatt-hours. Sunlight varies by season as well, with some areas receiving very little sunshine in the winter. Seattle in December, for example, gets only about 0.7 kilowatt-hours per day. It should also be noted that these figures represent the maximum available solar energy that can be captured and used, but solar collectors capture only a portion of this, depending on their efficiency. For example, a one square meter solar electric panel with an efficiency of 15 percent would produce about one kilowatt-hour of electricity per day in Arizona.

Wind Power: The movement of the atmosphere is driven by differences of temperature at the Earth's surface due to varying temperatures of the Earth's surface when lit by sunlight. Wind energy can be used to pump water or generate electricity, but requires extensive areal coverage to produce significant amounts of energy.

Harnessing power from the wind is one of the cleanest and most sustainable ways to generate electricity as it produces no toxic pollution or global warming emissions. Wind is also abundant, inexhaustible, and affordable, which makes it a viable and large-scale alternative to fossil fuels.

Despite its vast potential, there are a variety of environmental impacts associated with wind power generation that should be recognized and mitigated.

Benefits:

Wind energy is the fastest growing source of electricity in the world. In 2012, nearly 45,000 megawatts (MW) of new capacity were installed worldwide. This stands as a 10 percent increase in annual additions compared with 2011.

The United States installed a record 13,351 MW of wind power in 2012, capable of producing enough electricity to power more than 3 million typical homes. While wind energy accounted for just fewer than



four percent of U.S. electricity generation in 2012, it already generates more than 10 percent of the electricity in nine U.S. states. The significant benefits include, it significantly reduced costs, and wind power is poised to play a major role as we move toward a sustainable energy future.

Hydroelectric Energy: This form uses the gravitational potential of elevated water that was lifted from the oceans by sunlight. It is not strictly speaking renewable since all reservoirs eventually fill up and require very expensive excavation to become useful again. At this time, most of the available locations for hydroelectric dams are already used in the developed world.

Benefits:

Hydroelectricity does not use water, all of the water is returned to its source of origin. Hydroelectric power can be created 24/7 indefinitely assuming that the body of water it is utilizing never runs dry. It is also another absolutely clean source of energy. The power plants, once in place, do not create any waste byproducts in their conversion. Dams constructed can also shut their gates and conserve the water for use when power is in higher demand.

Biomass Energy: It is the term for energy from plants. Energy in this form is very commonly used throughout the world. Unfortunately the most popular is the burning of trees for cooking and warmth. This process releases copious amounts of carbon dioxide gases into the atmosphere and is a major contributor to unhealthy air in many areas. Some of the more modern forms of biomass energy are methane generation and production of alcohol for automobile fuel and fuelling electric power plants.

Benefits:

In many ways, biomass is a new source of power. While wood has always served as a fuel source for fires and ovens and conventional heating methods, biomass energy advancements are a few steps beyond that. Now these biomass fuel products are harvested and mass-produced and used in everything from engines to power plants.

Other benefits are as follows;

- No Harmful Emissions
- Clean Energy
- Abundant and Renewable
- Reduce Dependency on Fossil Fuels
- Reduce Landfills



- Can be Used to Create Different Products

Hydrogen and fuel cells: These are also not strictly renewable energy resources but are very abundant in availability and are very low in pollution when utilized. Hydrogen can be burned as a fuel, typically in a vehicle, with only water as the combustion product. This clean burning fuel can mean a significant reduction of pollution in cities. Or the hydrogen can be used in fuel cells, which are similar to batteries, to power an electric motor. In either case significant production of hydrogen requires abundant power. Due to the need for energy to produce the initial hydrogen gas, the result is the relocation of pollution from the cities to the power plants. There are several promising methods to produce hydrogen, such as solar power, that may alter this picture drastically.

Benefits:

- **Readily Available:** Hydrogen is a great source of energy for a number of reasons, the biggest one being that it is so readily available. While it may take some work to access, there is no element in the universe as abundant as hydrogen.
- **No Harmful Emissions:** Another advantage to using hydrogen energy is that when burned, it leaves almost no harmful byproducts. In fact, when used in NASA's spaceships, the burned hydrogen gas leaves behind clean drinking water for the astronauts.
- **Environment Friendly:** Hydrogen is also non-toxic, which makes it a rarity among fuel sources. Nuclear energy, coal, and gasoline are all either toxic or found in hazardous environments. This makes hydrogen ideal for use in a number of ways other fuel sources can't compete against
- **Used as Fuel in Rockets:** Hydrogen energy is also very powerful and very efficient. It's powerful enough to propel spaceships and safer than using any other similar product to accomplish such an energy-intensive duty. In fact, hydrogen is three times as powerful as gasoline and similar fossil fuels, meaning it takes less of it to accomplish more.
- **Fuel Efficient:** Hydrogen energy is very efficient fuel source than traditional sources of energy and produces more energy per pound of fuel. This clearly means that a car loaded with hydrogen fuel



with go much farther than the one using same amount of traditional source of energy.

- **Renewable:** Unlike non-renewable sources of energy which can't be produced again and again as they are limited; hydrogen energy can be produced on demand. Hydrogen is available in plenty. All we need is fossil fuels to break the water molecules to separate it from oxygen.

Geothermal Power: Energy left over from the original accretion of the planet and augmented by heat from radioactive decay seeps out slowly everywhere, everyday. In certain areas the geothermal gradient (increase in temperature with depth) is high enough to exploit to generate electricity. This possibility is limited to a few locations on Earth and many technical problems exist that limit its utility. Another form of geothermal energy is Earth energy, a result of the heat storage in the Earth's surface. Soil everywhere tends to stay at a relatively constant temperature, the yearly average, and can be used with heat pumps to heat a building in winter and cool a building in summer. This form of energy can lessen the need for other power to maintain comfortable temperatures in buildings, but cannot be used to produce electricity.

Benefits:

- **Significant Cost Saving :** Geothermal energy generally involves low running costs since it saves 80% costs over fossil fuels and no fuel is used to generate the power. Since, no fuel is require so costs for purchasing, transporting and cleaning up plants is quite low.
- **Reduce Reliance on Fossil Fuels:** Dependence on fossil fuels decreases with the increase in the use of geothermal energy. With the sky-rocketing prices of oil, many countries are pushing companies to adopt these clean sources of energy. Burning of fossil fuels releases greenhouse gases which are responsible for global warming
- **No Pollution:** This is one of the main advantages of using geothermal energy since it does not create any pollution and help in creating clean environment. Being the renewable source of energy, geothermal energy has helped in reducing global warming and pollution. Moreover, Geothermal systems does not create any pollution as it releases some gases from deep within the earth which are not very harmful to the environment



- **Direct Use:** Since ancient times, people have been using this source of energy for taking bath, heating homes, preparing food and today this is also used for direct heating of homes and offices. This makes geothermal energy cheaper and affordable. Although the initial investment is quite steep but in the long run with huge cost saving it proves quite useful
- **Job Creation and Economic benefits:** Government of various countries are investing hugely in creation of geothermal energy which on other hand has created more jobs for the local people

Other Forms of Energy: Energy from tides, the oceans and hot hydrogen fusion are other forms that can be used to generate electricity.

Jobs and Other Economic Benefits

Compared with fossil fuel technologies, which are typically mechanized and capital intensive, the renewable energy industry is more labor-intensive. This means that, on average, more jobs are created for each unit of electricity generated from renewable sources than from fossil fuels.

Renewable energy already supports thousands of jobs in the United States. For example, in 2011, the wind energy industry directly employed 75,000 full-time-equivalent employees in a variety of capacities, including manufacturing, project development, construction and turbine installation, operations and maintenance, transportation and logistics, and financial, legal, and consulting services. More than 500 factories in the United States manufacture parts for wind turbines, and the amount of domestically manufactured equipment used in wind turbines has grown dramatically in recent years: from 35 percent in 2006 to 70 percent in 2011.

Other renewable energy technologies employ even more workers. In 2011, the solar industry employed approximately 100,000 people on a part-time or full-time basis, including jobs in solar installation, manufacturing, and sales; the hydroelectric power industry employed approximately 250,000 people in 2009; and in 2010 the geothermal industry employed 5, 200 people.

Increasing renewable energy has the potential to create still more jobs. In 2009, the Union of Concerned Scientists conducted an analysis



of the economic benefits of a 25 percent renewable energy standard by 2025; it found that such a policy would create more than three times as many jobs as producing an equivalent amount of electricity from fossil fuels—resulting in a benefit of 202,000 new jobs in 2025.

In addition to the jobs directly created in the renewable energy industry, growth in renewable energy industry creates positive economic “ripple” effects. For example, industries in the renewable energy supply chain will benefit, and unrelated local businesses will benefit from increased household and business incomes.

In addition to creating new jobs, increasing our use of renewable energy offers other important economic development benefits. Local governments collect property and income taxes and other payments from renewable energy project owners. These revenues can help support vital public services, especially in rural communities where projects are often located.

Conclusion

The ability to harness and use different forms of renewable energy has transformed living conditions for billions of people, enabling them to enjoy a level of comfort and mobility. However, there are many people still lacks access to the renewable energy sources and also unaware of the benefits of these energies. The renewable energy like Solar power, Wind power, Hydroelectric Energy, Biomass Energy etc that are generated from natural resources supports the mankind to live in a friendly environment. We need to conserve the natural resources specially the renewable energies realizing their benefits in our own life to meet the needs of the future generations.

References

Deyette, J., and B. Freese. 2010. Burning coal, burning cash: Ranking the states that import the most coal. Cambridge, MA: Union of Concerned Scientists.

Machol, Rizk. 2013. Economic value of U.S. fossil fuel electricity health impacts. *Environment International* 52 75–80.

NREL. 2013. U.S. Renewable Energy Technical Potentials: A GIS-Based Analysis.

Wiser, Ryan, and Mark Bolinger. 2012. 2011 Wind Technologies Market Report. US Department of Energy.