

XI Green Energy

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Abstract: Green energy is at the heart of all ecological strategies because it affects companies in three vital areas: environmental, economic, and social. Conventional energy sources based on oil, coal, and natural gas have proven to be highly effective drivers of economic progress, but at the same time damaging to the environment and to human health. The potential of renewable energy sources is enormous as they can in principle meet many times the world's energy demand. Renewable energy sources such as biomass, wind, solar, hydropower, and geothermal can provide sustainable energy services, based on the use of routinely available, indigenous resources. Renewable energy sources currently supply somewhere between 15 percent and 20 percent of world's total energy demand. The supply is dominated by traditional biomass, mostly fuel wood used for cooking and heating, especially in developing countries in Africa, Asia and Latin America. A major contribution is also obtained from the use of large hydropower; with nearly 20 percent of the global electricity supply being provided by this source. New renewable energy sources (solar energy, wind energy, modern bio-energy, geothermal energy, and small hydropower) are currently contributing about two percent. A number of scenario studies have investigated the potential contribution of renewables to global energy supplies, indicating that in the second half of the 21 st century their contribution might range from the present figure of nearly 20 percent to more than 50 percent with the right policies in place.

Key-words: Green Energy, renewable energy, indigenous resources, ecological strategies

Introduction: Green energy renewable energy sources although there are some differences between renew-Green energy is any energy type that is generated from natural resources, such as sunlight, wind or water. It often comes from able and green energy, which we will explore below. The key with these energy resources are that they don't harm the environment through factors such as releasing greenhouse gases into the atmosphere.

As a source of energy, green energy often comes from renewable energy technologies such as solar energy, wind power, geothermal energy, biomass and hydroelectric power. Each of these technologies works in different ways, whether that is by taking power from the sun, as with solar panels, or using wind turbines or the flow of water to generate energy.

In order to be deemed green energy, a resource cannot produce pollution, such as is found with fossil fuels. This means that not all sources used by the renewable energy industry are green. For example, power generation that burns organic material from sustainable forests may be renewable, but it is not necessarily green, due to the CO₂ produced by the burning process itself.

Green energy sources are usually naturally replenished, as opposed to fossil fuel sources like natural gas or coal, which can take millions of years to develop. Green sources also often avoid mining or drilling operations that can be damaging to eco-systems.



Types

The main sources are wind energy, solar power and hydroelectric power (including tidal energy, which uses ocean energy from the tides in the sea). Solar and wind power are able to be produced on a small scale at people's homes or alternatively, they can be generated on a larger, industrial scale.

1. Solar Power

This common renewable, green energy source is usually produced using photovoltaic cells that capture sunlight and turn it into electricity. Solar power is also used to heat buildings and for hot water as well as for cooking and lighting. Solar power has now become affordable enough to be used for domestic purposes including garden lighting, although it is also used on a larger scale to power entire neighborhoods.

2. Wind Power

Particularly suited to offshore and higher altitude sites, wind energy uses the power of the flow of air around the world to push turbines that then generate electricity.

3. Hydropower

Also known as hydroelectric power, this type of green energy uses the flow of water in rivers, streams, dams or elsewhere to produce energy. Hydropower can even work on a small scale using the flow of water through pipes in the home or can come from evaporation, rainfall or the tides in the oceans.

4. Geothermal Energy

This type of green power uses thermal energy that has been stored just under the earth's crust. While this resource requires drilling to access, thereby calling the environmental impact into question, it is a huge resource once tapped into. Geothermal energy has been used for bathing in hot springs for thousands of years and this same resource can be used for steam to turn turbines

and generate electricity. The energy stored under the United States alone is enough to produce 10 times as much electricity as coal currently can. While some nations, such as Iceland, have easy-to-access geothermal resources, it is a resource that is reliant on location for ease of use, and to be fully 'green' the drilling procedures need to be closely monitored.

5. Biomass

This renewable resource also needs to be carefully managed in order to be truly labelled as a 'green energy' source. Biomass power plants use wood waste, sawdust and combustible organic agricultural waste to create energy. While the burning of these materials releases greenhouse gas these emissions are still far lower than those from petroleum-based fuels.

6. Biofuels

Rather than burning biomass as mentioned above, these organic materials can be transformed into fuel such as ethanol and biodiesel. Having supplied just 2.7% of the world's fuel for transport in 2010, the biofuels are estimated to have the capacity to meet over 25% of global transportation fuel demand by 2050.

Importance of green energy:

Green energy is important for the environment as it replaces the negative effects of fossil fuels with more environmentally-friendly alternatives. Derived from natural resources, green energy is also often renewable and clean, meaning that they emit no or few greenhouse gases and are often readily available.

Even when the full life cycle of a green energy source is taken into consideration, they release far less greenhouse gases than fossil fuels, as well as few or low levels of air pollutants. This is not just good for the planet but is also better for the health of people and animals that have to breathe the air.

Green energy can also lead to stable energy prices as these sources are often produced locally and are not as affected by geopolitical crisis, price spikes or supply chain disruptions. The economic benefits also include job creation in building the facilities that often serve the communities where the workers are employed. Renewable energy saw the creation of 11 million jobs worldwide in 2018, with this number set to grow as we strive to meet targets such as net zero.

Due to the local nature of energy production through sources like solar and wind power, the energy infrastructure is more flexible and less dependent on centralised sources that can lead to disruption as well as being less resilient to weather related climate change.

Green energy also represents a low cost solution for the energy needs of many parts of the world. This will only improve as costs continue to fall, further increasing the accessibility of green energy, especially in the developing world.



Examples

There are plenty of examples of green energy in use today, from energy production through to thermal heating for buildings, off-highway and transport. Many industries are investigating green solutions and here are a few examples:

1. Heating and Cooling in Buildings

Green energy solutions are being used for buildings ranging from large office blocks to people's homes. These include solar water heaters, biomass fuelled boilers and direct heat from geothermal, as well as cooling systems powered by renewable sources.

2. Industrial Processes

Renewable heat for industrial processes can be run using biomass or renewable electricity. Hydrogen is now a large provider of renewable energy for the cement, iron, steel and chemical industries.

3. Transport

Sustainable biofuels and renewable electricity are growing in use for transportation across multiple industry sectors. Automotive is an obvious example as electrification advances to replace fossil fuels, but aerospace and construction are other areas that are actively investigating electrification.

Economically Viable

Understanding the economic viability of green energy requires a comparison with fossil fuels. The fact is that as easily-reached fossil resources begin to run out, the cost of this type of energy will only increase with scarcity.

At the same time as fossil fuels become more expensive, the cost of greener energy sources is falling. Other factors also work in favour of green energy, such as the ability to produce relatively inexpensive localised energy solutions, such as solar farms. The interest, investment

and development of green energy solutions is bringing costs down as we continue to build up our knowledge and are able to build on past breakthroughs.

As a result, green energy can not only become economically viable but also the preferred option.

The Most Efficient types

Efficiency in green energy is slightly dependent on location as, if you have the right conditions, such as frequent and strong sunlight, it is easy to create a fast and efficient energy solution.

Currently, wind farms are seen as the most efficient source of green energy as it requires less refining and processing than the production of, for example, solar panels. Advances in composites technology and testing has helped improve the life-span and therefore the LEC of wind turbines. However, the same can be said of solar panels, which are also seeing a great deal of development.

Green energy solutions also have the benefit of not needing much additional energy expenditure after they have been built, since they tend to use a readily renewable source of power, such as the wind. In fact, the total efficiency of usable energy for coal is just 29% of its original energy value, while wind power offers a 1164% return on its original energy input.

Renewable energy sources are currently ranked as follows in efficiency (although this may change as developments continue):

1. Wind Power
2. Geothermal
3. Hydropower
4. Nuclear
5. Solar Power

Green Energy Vs Clean Energy Vs Renewable Energy – Difference

As we touched upon earlier, there is a difference between green, clean and renewable energy. This is slightly confused by people often using these terms interchangeably, but while a resource can be all of these things at once, it may also be, for example, renewable but not green or clean (such as with some forms of biomass energy).

Green energy is that which comes from natural sources, such as the sun. Clean energy are those types which do not release pollutants into the air, and renewable energy comes from sources that are constantly being replenished, such as hydropower, wind power or solar energy.

Renewable energy is often seen as being the same, but there is still some debate around this. For example, can a hydroelectric dam which may divert waterways and impact the local environment really be called 'green?'

However, a source such as wind power is renewable, green and clean – since it comes from an environmentally-friendly, self-replenishing and non-polluting source.

Conclusions: Green energy looks set to be part of the future of the world, offering a cleaner alternative to many of today's energy sources. Readily replenished, these energy sources are not just good for the environment, but are also leading to job creation and look set to become

economically viable as developments continue. The fact is that fossil fuels need to become a thing of the past as they do not provide a sustainable solution to our energy needs. By developing a variety of green energy solutions we can create a totally sustainable future for our energy provision, without damaging the world we all live on.

TWI has been working on different green energy projects for decades and has built up expertise in these areas, finding solutions for our Industrial Members ranging from electrification for the automotive industry to the latest developments in renewable energy.

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