

RENEWABLE ENERGY

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First of all, renewable energy includes five main elements: wind, solar (photovoltaic), geothermal, hydropower, and biomass.

Wind power harnesses the energy of moving air through the use of wind turbines. These turbines employ large rotor blades installed at considerable heights on both land and sea to capture the kinetic energy created by the wind.

As the wind moves across the turbine blades, it leads to reduced air pressure on one side, creating a force known as lift, that pulls the blade downwards. The variation in air pressure across the two sides induces the rotation of the blades, setting the rotor in motion.

The rotor is connected to a turbine generator, which rotates to convert the kinetic energy of the wind into electricity.

Solar (Photovoltaic): Solar technologies capture sunlight and transform it into electricity. Photovoltaic (PV) solar cells consist of a semiconductor wafer with positive and negative sides, forming an electric field. When sunlight strikes the cell, the semiconductor absorbs it and transfers the energy as electrons, which are captured by the electric field in the form of an electric current. The generation of electricity by a solar system depends on factors such as the semiconductor material used and the prevailing environmental conditions. Geothermal: Geothermal energy originates from the Earth's core, where heat from the core heats underground reservoirs of water. Geothermal plants typically extract hot water from these reservoirs through wells and convert it into steam for a turbine generator. Reinjecting the extracted water and steam enhances the sustainability of geothermal energy, turning it into a renewable source. Hydropower: Much like wind turbines, hydropower plants, hydropower plants convert the kinetic energy of flowing water into electricity using a turbine generator. These plants are often located near bodies of water and utilize diversion

structures such as dams to alter the water flow. The amount of energy produced depends on the volume and change in elevation of the flowing water.

Biomass: Biomass, including organic materials like wood, dry leaves, and agricultural waste, has been a source of energy for heating since ancient times. Burning biomass in a boiler produces high-pressure steam, which rotates a turbine generator to generate electricity. While biomass is renewable because it can be regrown, emissions from its combustion can vary, and in some cases, they are higher than those from other clean sources. Additionally, biomass can be converted into liquid or gaseous fuels for transportation.

Renewable energy sources are essential in meeting the increasing global energy needs and combating climate change.

First of all, renewable energy reduces carbon emission. Traditional energy sources, such as coal and oil, release vast amounts of greenhouse gases into the atmosphere, contributing to global warming and climate change. Renewables, on the other hand, generate power with minimal or zero emissions, mitigating the environmental impact.

Secondly, it can give us energy independence. Unlike finite fossil fuel reserves, renewable energy sources are virtually inexhaustible. Sunlight, wind, and flowing water are abundant resources that can be harnessed for power generation. By diversifying our energy mix and reducing dependence on non-renewable resources, countries can achieve greater energy independence and security.

Consequently, the integration of renewable energy sources into the global energy landscape is not just a choice but a necessity. It offers a path towards a cleaner, more sustainable future, where energy needs are met without compromising the health of our planet. The continued dedication to renewable energy underscores a collective responsibility to safeguard the environment and construct a resilient and fair world for the well-being of future generations. Continuous advancements in energy technologies are making them more affordable and easily accessible leading to their adoption.

The rapid growth of the renewable energy sector has spurred technological

innovations and advancements. Research and development in areas like energy storage, smart grids, and efficiency improvements have the potential to reshape the entire energy landscape. These innovations not only enhance the performance of renewable systems but also contribute to broader technological progress.

The renewable energy sector creates job opportunities.

The renewable energy sector has become a significant driver of economic growth and job creation. The installation, operation, and maintenance of renewable energy infrastructure require a skilled workforce. As the industry expands, it generates employment opportunities, fostering economic development in both urban and rural areas.

Governments and businesses worldwide are increasingly investing in energy projects as they strive to build a future for all.

Governments and businesses around the world are making substantial investments in energy projects, driven by the shared goal of building a sustainable and inclusive future. These investments are instrumental in addressing pressing challenges such as climate change, energy security, and economic development. The commitment to energy projects reflects a recognition of the pivotal role they play in shaping the trajectory of societies and economies.

In summary, the future lies in renewable energy, urging us to invest in this sector and explore diverse alternative energy sources. Nowadays, we have five main types of renewable energy: wind, solar, geothermal, hydropower and biomass.

The central query is: "When will Renewable Energy Take Center Stage?" According to the International Energy Agency (IEA), global renewable electricity capacity is anticipated to surge by 60% by 2026 compared to 2020, surpassing 4,800 gigawatts. This capacity matches the present combined power generation from fossil fuels and nuclear resources. This projection highlights the inexorable evolution of the worldwide energy landscape, emphasizing that the shift to renewables constitutes a substantial and continuous paradigm change.

Nowadays embracing energy goes beyond fulfilling corporate social responsibility or seeking long term returns, in a low interest rate environment. There

are business incentives for private sector stakeholders to actively adopt resources. Here are some important reasons:

Reducing vulnerability to energy price fluctuations. With the nature of oil prices in years energy costs have become a major uncontrollable factor in business and economic planning. For instance, IKEA, the furniture giant aiming to achieve 100% energy by 2020 aims to enhance its energy independence have better control over profit margins and contribute to the preservation of natural resources while minimizing its environmental impact. As renewable energy solutions become more affordable and efficient generating power on site is becoming an option.

The transition towards renewables will create increased demand, across sectors. Although wind, sunlight and tidal energy sources hold potential it is crucial to convert this energy into electricity and ensure its effective delivery.

Simultaneously, the advancement of technologies to enhance the effectiveness of renewable power generation and storage has emerged as a substantial growth market, exemplified by Tesla's \$1.3 billion investment in a new gigafactory dedicated to manufacturing batteries for electricity storage. Enhanced renewable services have the potential to catalyse advancements in electric cars and innovative projects like the the Hyperloop, an innovative vacuum tube transit system anticipated to heavily depend on solar power, signifies a disruptive force in the energy sector. This disruption brings forth new investment opportunities. As technologies for extracting power from renewable sources and the accompanying infrastructure advance, technology companies are positioned to become key players in the evolving energy landscape. This trend is projected to gain momentum with the introduction of cutting-edge power generation technologies, fostering developments like photovoltaic paint and nano-engineered solar panels. The nanotech industry, in particular, holds significant importance in the evolution of renewable energy. Emerging applications such as nanofluids enhancing heat capture in geothermal plants, spherical core-shell nanoparticles boosting the efficiency of hydrogen storage, nano-cells extracting energy from surfaces like paint, glass, concrete, and brick walls, as well as superconducting cables based on carbon nanotubes, exemplify the potential

contributions of nanotechnology in the energy domain.

References:

Lobko, O. L. (2023, February 11). The Role of Renewable Energy. EcoMatcher. Retrieved October 13, 2023, from <https://www.ecomatcher.com/the-role-of-renewable-energy/>Lobko, O. L. (n.d.). GM Set to Reach 100 Percent Renewable Energy in the U.S. 5 Years Ahead of Schedule. Retrieved October 13, 2023, from <https://news.gm.com/newsroom.detail.html/Pages/news/us/en/2021/sep/0930-renewable.html>