

THE FUTURE OF ENERGY



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As the earth's population grows and humanity's energy needs rise exponentially, so do the problems of environmental pollution and the risk of causing permanent damage to the planet's ecosystem.

Renewable energy sources are those that come from natural sources that are replenished at a higher rate than they are consumed. Every energy source we use today has advantages and disadvantages. Hydroelectricity harnesses the energy of water moving from higher to lower elevations. It is ecological, it does not cause pollution of the environment, but there are limited parts of the world that have the large quantities of water needed to produce sufficient amounts of energy. Solar energy can provide heat, cooling, natural lighting, electricity and clean fuel (hydrogen) for a range of applications. Wind energy harnesses the kinetic energy of the air by using large wind turbines located on land or at sea. The problem with solar and wind energy is that large areas are needed to produce sufficient amounts of energy. Other sources of renewable energy are geothermal, biomass energy and ocean energy derived from technologies that use the kinetic and thermal energy of seawater.

Non-renewable energy sources are those that use fossil fuels such as coal, oil and natural gas, resources that take hundreds of millions of years to form. Fossil fuels, when burned to produce energy, emit harmful greenhouse gases such as carbon dioxide. Another source of non-renewable sources is nuclear fuel that uses radioactive elements (e.g. Uranium), which although it produces large amounts of energy, is very harmful to the environment and causes great ecological damage in the event of accidents.

But there is another type of nuclear energy which would solve the energy problem entirely, without harmful effects on the environment. It is the energy derived from nuclear fusion which does not need any radioactive elements but only hydrogen which is abundant in water. Nuclear fusion is a process by which nuclear reactions between light elements produce heavier elements (e.g. hydrogen to helium). Fusion reactions are the fundamental source of energy of stars, including the Sun. In the Sun's core, enormous gravitational pressures allow fusion to operate at temperatures of about 10 million degrees Celsius. At

the much lower pressures possible on Earth, temperatures to produce fusion must be much higher - over 100 million degrees Celsius.

This process proved too difficult to simulate on earth. Recently, however, researchers in Europe and America have achieved the goal of starting the process. The next stage is to produce more energy than is needed to start the process. If this is achieved, then clean energy in almost unlimited quantities will become a reality. It is enough to think that, theoretically speaking, with a glass of water, enough energy could be produced for the needs of a person for his entire life.

More information on nuclear fusion:

<https://www.bbc.com/news/science-environment-60312633>

<https://cfs.energy/>