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All truth about renewable energy

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Humanity has always faced the problem of providing enough energy for growing needs. Periodically arising, and in some countries, existing energy problems prove the importance of solving this issue.

Due to the influence of man on the environment, negative effects begin to appear at an increasing rate: thermal, chemical, radioactive contamination of the environment in combination with the rapid reduction of readily available fuel, especially oil, gas, high-quality coal. Reducing the stocks of organic fuels necessitates the creation of power plants using the energy of the sun, wind, the ocean in its various forms, and the thermal energy released in the earth's crust in deep processes. This energy is renewable and almost inexhaustible. However, energy-saving technologies, which include renewable energy sources, do not have a corresponding economic justification [1].

Renewable energy is derived from natural processes that are replenished constantly. In its various forms, it is derived directly from the sun, wind, ocean, hydropower, biomass, geothermal resources and so on.

Solar energy, radiant light and heat from the sun, is harnessed using a range of ever-evolving technologies such as solar heating, photovoltaics, concentrated solar power (CSP), concentrator photovoltaics (CPV), solar architecture and artificial photosynthesis. Passive solar techniques include orienting a building to the sun, selecting materials with

favorable thermal mass or light dispersing properties, and designing spaces that naturally circulate air. Active solar technologies encompass solar thermal energy, using solar collectors for heating, and solar power, converting sunlight into electricity either directly using photovoltaics (PV), or indirectly using concentrated solar power (CSP) [1].

Wind power is a branch of the power industry that specializes in converting the kinetic energy of air masses in the atmosphere into electrical, mechanical, thermal or any other form of energy convenient for use in the national economy. Such a conversion can be carried out by such units as a wind generator (for generating electric power), a windmill (for conversion into mechanical energy), a sail (for use in transport), and others.

Wind energy is a renewable energy source that is secondary to solar energy. Motion of air means kinetic energy, which can be captured. In the case of a wind-electric turbine, the turbine blades are designed to capture the kinetic energy in wind. When it happens, blades start moving, they spin a shaft that leads from the hub of the rotor to a generator. The generator turns that rotational energy into electricity.

Hydropower is electricity generated using the energy of moving water. A typical hydro plant is a system with three parts: an electric plant where the electricity is produced, a dam that can be opened or closed to control water flow, and a reservoir where water can be stored. The water behind the dam flows through an intake and pushes against blades in a turbine, causing them to turn. The turbine spins a generator to produce electricity.

Biomass is biological material derived from living, or recently living organisms. As an energy source, biomass can either be used directly via combustion to produce heat, or indirectly after converting it to various forms of biofuel. Wood remains the largest biomass energy source today.

From the very beginning of its development, alternative energy caused a share of criticism. Among opponents who considered this direction ineffective, there was also the Nobel Prize winner in physics Peter Kapitsa. Today, the efficiency of renewable energy sources (RES) is 15%, which is not enough to provide humanity with the required amount of energy. And to this day, alternative energy continues to be criticized, and there are a number of reasons for this [2].

Wind energy and solar energy are unregulated sources of energy. The development of a wind farm, as well as the work of solar power plants, directly depends on the weather conditions and time of day - factors that are highly volatile. Accordingly, the delivery of energy from these alternative energy resources in the power system is characterized by great unevenness. In this regard, the use of these types of power plants requires a reserve of power in the system. These reserves should be included in the line only at the moment when the windmills or solar batteries cease their work. Obviously, such operation leads to even more consumption of resources and to more emissions into the environment.

Another significant challenge to the cost-effective use of renewable energy sources is their costly and complex maintenance. Thus, large wind turbines are experiencing significant repair problems, since replacing a large part (blade, rotor, etc.) at an altitude of more than 100 meters requires the accumulation of multiple resources. The German research company Fraunhofer Society published a disappointing report on the use of coastal wind turbines. The results are staggering: because of the aggressiveness of the working environment, the cost of repairing turbines for the entire lifetime of their operation exceeds the cost of a new turbine by two times. Sea water and sea air are very corrosive to metals, as a result of which the maintenance of windmills has to spend significant amounts [3].

The most important problem on the way to expanding and developing RES is their cost. Despite the fact that over the past decades the level of electricity prices produced by renewable energy sources has fallen significantly, it is too early to speak about their real competitiveness compared to the prices for electricity produced by burning coal or gas. If we compare the price level for electricity produced by Germany, the world leader in the use of renewable energy sources, then it is obvious that in most cases it is more profitable to buy electricity produced by burning coal (0.035-0.055 € per kWh), but not produced by the cheapest of RES – wind power (0.043-0.105 € per kWh) [3].

Today, about half of the world's energy balance falls to oil, about a third - to gas and atomic (about one-sixth) and about one-fifth to coal. All other sources of energy remain only a few percent. It is absolutely clear that without heat and nuclear power plants at the present stage, mankind cannot exist. Therefore, alternative sources of energy should be introduced to facilitate the inevitable transition from traditional energy to alternative energy.

References:

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