

## **ENERGY REVOLUTION: ALTERNATIVE ENERGY SOURCES AS A VECTOR OF THE FUTURE**

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A period of significant changes has come in the energy world. The classic old resources, despite their enormous impact on modern infrastructure, are suitable for exhaustion and cause serious environmental consequences.

In search of the most stable and clean future, the latest renewable energy technologies are being actively developed and introduced. In recent decades, there has been increasing interest in introducing alternative forms of energy into existing energy supply systems. In this review, we will focus on more promising directions in this area, as well as analyze the disadvantages and advantages of each of the selected types.

### **I. Solar energy:**

1. Innovations in solar panels: The technology of photovoltaic converters is constantly improving, which leads to an increase in their performance and an impressive reduction in price. Flexible, transparent, and integrated solar panels are emerging in the market.

2. Solar thermal power plants: These systems use solar radiation to heat working fluids, which subsequently power turbines. Their productivity is especially high in regions with significant solar activity and accumulation of sunlight.

3. Hybrid systems: The combination of photovoltaic and thermal technologies makes it possible to use solar energy most productively in different conditions [1].

### **II. Wind energy:**

1. Development of wind turbines: Modern turbines demonstrate increased power and high efficiency. Particular interest is paid to offshore wind farms, which exploit the most powerful and stable offshore eddies.

2. New designs: Scientists are working on the formation of low-noise and adaptive wind turbines optimized for different wind activity conditions.

### III. Geothermal energy:

1. Geothermal power plants: The use of the Earth's internal heat to generate electricity is becoming increasingly important, especially in regions with significant geothermal activity.

2. Geothermal heating and cooling: The heat of the Earth is also used in heating and air conditioning systems of buildings, providing a stable and economical solution for climatic conditions. These trends reveal the latest horizons in the energy sector, allowing us to switch to the most robust and environmentally friendly future.

### IV. Alternative hydropower:

1. Decentralized hydroelectric power plants: Located along the coast of small rivers and streams, these plants significantly reduce the negative impact on nature.

2. The energy of the sea elements: Tidal energy professionally applies the fluctuations of the tide and ebb and waves' power. Despite the current limitations, the development prospects are high.

### V. Bioenergy:

1. Plant resources: The use of waste from plants and specially cultivated crops to generate energy with an emphasis on long-term stability.

2. Biomethane (renewable natural gas): A product of methane from organic fragments, which opens up possibilities both in the electric power industry and as an environmentally friendly fuel source [2].

### VI. Hydrogen energy:

1. Electrical separation of water: The use of electricity from renewable sources for the purpose of splitting  $H_2O$  molecules into hydrogen and oxygen used in fuel cells.

2. Conservation of green energy: Hydrogen is a reliable storage of excess electricity from renewable sources.

### VII. Modern nuclear technologies:

1. Fourth generation of reactors: Creation of the safest and most environmentally friendly nuclear power plants minimizing the formation of radioactive residues.

2. Thermonuclear fusion: Research on the reproduction of the solar process in order to obtain inexhaustible amounts of energy. Despite the

difficulties, this area promises a radical solution to global energy problems in the future.

The formation of new energy sources is associated with some difficulties and challenges:

1. Financial costs: Currently, many technological processes have high initial costs of installation.

2. Efficiency: Supporting research is required to increase energy conversion performance.

3. Energy storage: We need reliable ways to conserve energy from renewable sources.

4. Infrastructural support: It is necessary to create an appropriate infrastructure for the purpose of distribution, as well as the use of the latest energy solutions. Moreover, lack of infrastructure is a barrier to renewable energy development [3]. Despite the existing problems, the formation of other energy sources is considered the main direction in order to achieve a stable energy future. The development of scientific research, the introduction of innovations, as well as government assistance will contribute to the popularization of these technologies, as well as the development of the most environmentally friendly and safe energy system. The importance of development in this direction is reflected in the lack of natural resources, the deterioration of the environmental situation and the lack of energy around the world. The problem will be solved only if everyone starts taking small steps towards implementing a plan to develop ways to obtain safe energy. Today, this is the most important point in the life of mankind.

### **References**

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