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ASSESSMENT OF THE NATURAL RESOURCE POTENTIAL OF ROCK DUMPS IN MINING REGIONS

An important condition for the smooth functioning of all sectors of the economy is to ensure sustainable energy supply. Today, the threat of depletion of mineral resources is the most acute, so it is important to find and use alternative energy sources to meet energy needs. It is important to take into account their environmental friendliness and renewability.

Ukraine is an energy-dependent country, with imports amounting to about 72%. Therefore, taking into account the negative impact on the environment, the development and use of renewable energy sources (RES) is a priority to ensure the energy independence of our country.

The ability of the natural complex or its individual components to satisfy society's needs for energy, raw materials, and the implementation of various types of economic activity constitute its natural resource potential.

The degree of transformation of the natural resource potential of territories disturbed by mining operations determines the possibility of reclamation or use of these territories for the needs of society.

The most interesting thing today is the attraction of land unsuitable for agricultural needs for renewable energy sources - solar panels, wind turbines, or the creation of forest park recreation areas.

The prospects for the use of renewable energy sources on technologically altered lands in mining regions are very high. There is no doubt that the level of specific energy consumption in Ukraine is higher than it could or should be, especially in comparison with neighboring EU countries. The main obstacles to the development of renewable energy sources and improvement of energy efficiency in Ukraine include the following: insufficient popularization and awareness of renewable energy and energy efficiency measures and their application; insufficient technical development; and excessive market regulation. It should also be noted that there is a significant shortage of land plots for renewable energy facilities, which is not available in mining regions.

The most promising direction of renewable energy is the use of wind turbines. The objects of the technogenic landscape of mining areas are characterized by a significant height in relation to the daytime surface level. This value reaches 100-120 m and can increase with time. Taking into account that wind speed increases with height, the energy potential of the territory where such objects are located also increases [1].

Wind energy has long been viewed as a clean, inexhaustible source of energy. The shortage of non-renewable energy sources and growing dependence on imported fuels have led to a revival of research aimed at expanding the ability to convert wind energy into a usable form of energy.

Advantages of wind energy [2]:

– low cost of production;

– wind power can compete with nuclear, coal and gas power;

– zero cost of the fuel component, the energy source is inexhaustible and available in unlimited quantities;

– environmentally acceptable energy;

– energy production is not accompanied by carbon dioxide emissions;

– wind energy does not have risks associated with the volatility of fossil fuel prices;

– wind power allows us to avoid dependence on energy imports;

– modular design, quick installation;

– electricity supply is comparable in volume to traditional generation methods;

– dispersion over the territory;

– wind power does not interfere with agriculture and industrial activities near wind farms;

– the possibility of using technologically disturbed lands in mining regions.

In modern conditions, man-made mining landscapes are not only widespread, but also quite diverse.

In Ukraine, the most perspective resource waste should include [3]:

1) tailings of ferrous and non-ferrous metal ore enrichment, the total reserves of which (Kremenchutsk-Kryvorizkyi Iron Ore Basin) already reach 2.5 billion tons with a total iron content of 14-20%, and in the Nikopol-manganese ore district - 240 million tons, the content manganese in which is 10-15%. Utilization of sludge from the Mykolaiv alumina plant will allow obtaining gold-rutile-zirconium (gold – 36-42%, zircon – 40-60%, rutile – 14-20%) concentrates;

2) lost mineral raw materials of previously developed deposits, the volume of which reaches 30-40% of outlined reserves, the content of total iron in which is 45-67%;

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4) stocks of poor and oxidized ores, which are stored in dumps.

The use of these resources will allow obtaining additional volumes of iron ore concentrate and materials for the construction industry.

The second effective way of using the natural potential of man-made landscape objects is wind energy. Let's consider the wind energy potential of external dumps. In a wind flow, the wind speed increases with increasing height above the Earth's surface. Objects of man-made landscape of mining areas (dumps) are characterized by a significant height in relation to the day surface mark. This value reaches 100-120 m and may grow over time.

Electricity generation in the conditions of Kryvbas dumps by vertical and horizontal wind turbines with a capacity of 100 kW is presented in Table 1 [3].

Table 1. Electricity generation in the conditions of Kryvbas dumps by vertical and horizontal wind turbines with a capacity of 100 kW

Wind speed, m/s	Number of days with wind, per year, days	Capacity of a vertical wind turbine, %.	Electricity generated, kW-days	Capacity of a horizontal wind turbine, %.	Electricity generated, kW-days
1.8	-	-	-	-	-
2	9	1 %	9		
2.5	12	2 %	24		
3	67	6 %	402		
4	76	13 %	988		
5	79	22 %	1738	1 %	79
6	54	34 %;	1836	3 %	162
7	36	46 %	1656	7 %	252
8	18	57 %	1026	12 %	216
9	6	70 %	420	22 %	132
10	4	84 %	336	38 %	152
11	2	100 %	200	48 %	96
12	1	100 %	108	59 %	59
13	1	100 %	108	80 %	80
14	-	100 %	-	100 %	-
Total	365	-	8849	-	1228

Based on the results of Table 1, in Kryvyi Rih, vertical wind turbines can produce electricity more than 7 times more than traditional (horizontal) wind turbines.

The objects of the technogenic landscape of mining areas, for example, Kryvbas, where average annual wind speeds rarely exceed 3.5-4.5 m/s and are characterized by a significant height of 100-120 m in relation to the day surface level and variability, therefore, in the conditions of mining regions, it is effective to use wind turbines with a vertical axis of rotation of the turbine with a magnetic levitating bearing.

Based on the above, it follows that wind turbines will not pollute air, water, soil, or generate hazardous waste when generating electricity, as is the case with mining and transportation of minerals in mining regions. They do not deplete natural resources such as coal, oil and gas and do not cause environmental pollution. Clean wind energy can reduce the environmental damage caused by fuel-based energy in Ukraine. In addition, the possibility of involving technologically disturbed lands in mining regions (including through the placement of wind turbines) in the economic activities of individual regions and the country as a whole is particularly promising.

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