Innovative Proposal for Wind-Solar Power Plant

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Abstract. The use of renewable energy sources can help solve the problem of energy supply. One of the ways of such a solution is to develop a wind - solar power plant called a hybrid, which simultaneously uses the energy of both wind and the sun. It is proposed to use a new type of medium-speed vertical axial wind power installation in a hybrid power plant with original blades with a high coefficient of utilization of wind energy and with improved characteristics in terms of strength. The wind wheel models offered in wind power installation are investigated using a wind tunnel. The power characteristic of the wind wheel was obtained, which showed the efficiency of the original blades at the level of world samples. Coefficient of use of wind energy ≈0.3. The wind wheel has a self-start and can operate at low speeds in different wind directions. The average speed of the wind wheel provides a lower value of centrifugal force on the blades. The ways of expediency and cost-effectiveness of using solar cells, which depend on the insolation value determined by the latitude of the location and on other factors, are given.

Keywords: a wind - solar power plant, a wind wheel, solar cells

To characterize the power of the new wind wheel with blades of a rotor KN-M: $\tilde{N}_{p_{\max}}$ = 29%; θmax = 1.85, an approximation was obtained from Eq. (1,2), which makes it possible to determine the number of revolutions of the axil of the wind wheel and the power of the wind power installation.
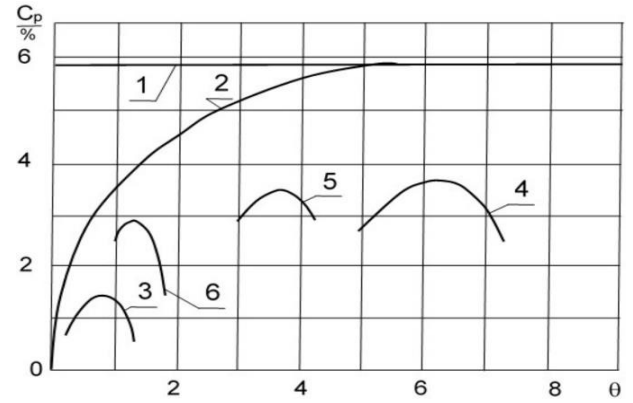
Left side of the characteristic (to the maximum Cp on the fig.1):

$$C_p = 29\left[1 - \frac{(\theta - 1,2)^2}{0,4225}\right]; \qquad (1)$$

right side of the characteristic (after maximum Cp on the fig.1):

$$C_p = 20,14\theta^2\left(3 - 1,66\theta\right) \qquad (2)$$

Figure 1. *The location of the power characteristics of the vertical axial wind power installation in terms of speed (θ) relative to the Betz (1) and Glauert (2) criteria: 3 - Savonius rotor; 4 - Daria rotor; 5 - rotor with straight wing blades NACA0018; 6 - rotor with blades KN-M.*

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