Environmental Engineering and Management Journal xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

"Gheorghe Asachi" Technical University of Iasi, Romania

A TECHNO-ECONOMIC ANALYSIS ON THE SELECTION OF WIND TURBINES

Muhammed Arslan Omar*, Gokhan Saltan

Department of Mechanical Engineering, Kafkas University, Kars, 36100, Turkey

Abstract

Wind energy as an alternative energy source is globally clean, accessible and limitless, and the developments in wind turbines in recent years have brought wind energy to the fore in alternative energy generation. In this study, RETScreen computer software, which is used in determining and selecting the efficiency of wind turbines, was used and the installation of a wind turbine at the Kafkas University campus was investigated. It has been detected that low-capacity turbines can be used even though the optimum wind speed average cannot be achieved for economical wind power plant (WPP) installation in Kars. According to the results of the study It has been found that a 300 kW wind turbine is suitable for a 2.5 m/s annual average wind speed of 40 m altitudes in Kars province and has been determined that this turbine generates an annual 131 MWh energy. This system made a 93% greenhouse gas reduction and the payback period of the system was calculated as 5.8 years. It is considering that the simple repayment will be 4 years and the equity repayment will be 5.8 years. The prevailing wind direction in the region is N-NNE. There is a significant wind frequency in the S-SSW direction. The project life-cycle 15-year debt ratio is specified as 70%. Considering the maturity of the debt, the interest rate is taken as 30% and the maturity is 15 years.

Key words: economic analysis, RETScreen software, renewable energy, wind energy evaluation, wind turbine

Received: January, 2023; Revised final: April, 2024; Accepted: April, 2024

* Author to whom all correspondence should be addressed: e-mail: m.arslanomar@gmail.com; Phone: +90 474 2251279; Fax: +90 474 2251282