ANNUAL AND DIURNAL WIND SPEED VARIATION AT DIFFERENT HEIGHTS: MOLDOVA'S CASE STUDIES

RACHIER Vasile, AZAROV Ana, TARITA Stella.
Technical University of Moldova

Reviewer: SOBOR Ion conf. univ. dr.ing.

Keywords: *Speed and wind direction, diurnal and seasonal variations, anemometer, vane.*

Wind energy development requires knowledge of wind potential both at country level, as well as at local level. To estimate the production of electricity in a day, a month or a year are necessary variations in windspeed measured at different heights. These variations are obtained as a result of the processing of data series measured on large periods of time either on the service Hydrometeorological (usually at a height of 10 m above ground level), either in the specialized measurement campaigns.

The objective of the study is the presentation of the results of measurements of characteristics of wind in the area named Codrii Moldovei with is located on the Moldova Plateau where is possible the construction of Wind Power Plants (WPP).

Measurement campaign started on 27 July 2010 and continued for a period of 2 years. Anemometers were mounted at three heights: 30, 20 and 10 m. At each height were mounted two anemometers placed in the North-South direction. The vane were fitted only at the height of 29 m and aligned in the North-South direction. Data acquisition, processing and storage-is carried out by the Logger NRG Symphonie PLUS ™ on a special floppy disk with a capacity of 16 MB. Data collected over a period of 24 h is transmitted via GSM network.

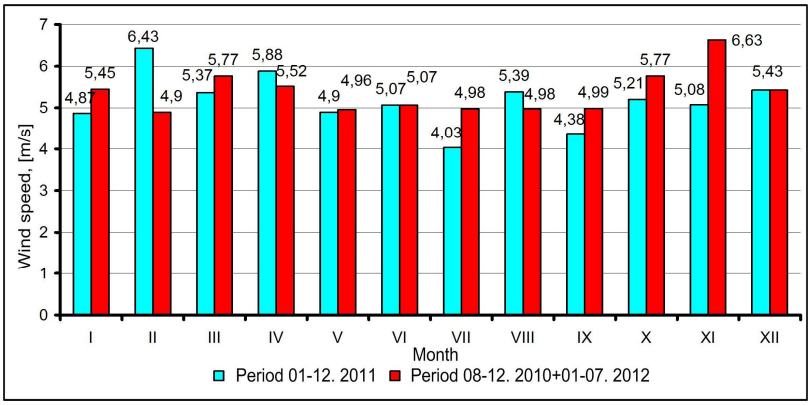

Figure 1. Annual variations of wind speed

Measurements have shown the maximum speeds during the cold season of the year: 6.43 m/s in February 2011 and 6.63 m/s (period 2 years) in November. Minimum speeds have been recorded in the warm season: July – 4.03 m/s in 2011 and 4.98 m/s for the period of 2 years. During the 2-year monthly average wind speed always remains equal or greater than 5 m/s which means that a wind turbine with startup speed of 3.5 m/s will produce energy at this location during all months. The average speed for the period of 2 years is equal to 5.25 m/s, Figure 1.

Analysis of measured data shows that annual average speeds were equal to 4.32, 4.87 and 5.25 m/s at heights of 10, 20 and 30 m respectively. Over a period of one year a conventional turbine placed in that area to a height of 10 m would produce energy for 6570 h, to a height of 20 m-7120 h and to a height of 30 m-7300 h.

The highest average wind speeds were recorded in winter, the lowest – summer. For 30 m height difference is 22.5%. The height above the ground is less than the more pronounced are diurnal variations of wind speed. The biggest changes took place in the spring and they constitute 22.5%.

It was found a clear trend: increasing the height (in our case from 10 to 60 m) changes the character of diurnal variation – a maximum speed towards evening-night hours.

Predominant wind directions were S, N, NE and NNW, and differ from those measured at 10 m height and published in monograph [3]. The explanation is the following: the at 10 m height wind direction is changed by orography land – valleys and hills placed on North – West or South – East line.

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