

Abstract

The analysis of the complementarity of wind and water resources of the justification of the energy matrix diversification of Colombia, which supports hydropower, which is directly affected by events such as ENSO macroclimatic and anthropogenic climate change.

From daily information and monthly series of wind speed and flow, we analyzed the wind resource and energy complementarity. The data used, at different heights of measurement, comprising several IDEAM and ISAGEN stations located in the Colombian Caribbean Coast. In the case of La Guajira, the analysis of Puerto Bolivar station showed a definite diurnal cycle of wind speed with a maximum of 8.7 m s⁻¹ between 15:00 and 16:00 hours and a minimum of 4 , 5 m s⁻¹. The annual cycle reported maximum of 7.2 m s⁻¹ in March and in July to 8.2 m s⁻¹, when the summer comes in the middle of the country, and minimum of 5.0 m s⁻¹ during the month of October. We verified the increase in speed with height between 20 m and 60 m, with a coefficient of 0.14 Hellman. This direction was determined as the predominant circulation pattern associated with the trade winds. Correlation was analyzed on a quarterly basis of the indices of ENSO and the North Atlantic Oscillation speed. Associated with the displacement of the ITCZ, on a monthly basis was identified with greater complementarity of wind flow from the north and center of the country, otherwise than with the southern rivers as the Patia, Cauca and Louise. Correlation analysis of wind speed tributaries flows Hydroelectric Projects and ISAGEN report the highest rate with river Sogamoso. With the wind speed and wind turbine characteristics 60/1300 Nordex Energy output was calculated separately compared with the historical generation plants ISAGEN without finding complementarity in the average annual cycle. The annual average energy of each project are estimated from a model under the RNO and estimated the size of wind energy to match these annual averages, requiring a fleet of 140 MW and 1,040 MW Amoyá match for Sogamoso, which indicates an increase in installed capacity. The integrated analysis performed with Sogamoso which has regulating reservoir, suggests a steady increase in energy and financially viable if operated fully with the Central Park of a 200 MW.

Keywords: Complementarity, wind energy, normal rules of operation, wind speed, ENSO, hydroelectricity.