Technical feasibility analysis and fluid dynamic simulation of a wind farm in the Northern region of Rio de Janeiro

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The use of fossil fuels as an energy source is linked to a series of problems, ranging from the possibility of depletion of these resources to pollution and environmental damage caused by their extraction. In this context, wind energy emerges as a clean, renewable and viable option for electrical energy, which Brazil has a large amount of resources to be explored. In 2020, wind energy surpassed natural gas, becoming the second largest source of electricity in Brazil, previewing to reaching a share of 13.7% of total generation from new enterprises that will come into operation . With this, feasibility studies and computer simulation have become increasingly important to reduce costs associated with prospecting new sites with wind potential. The present work aims to elaborate a technical feasibility analysis and computational simulation of a wind farm in the northern region of Rio de Janeiro. Initially, prospective studies will be carried out to select a suitable location for a possible wind installation. Then, the potential of the chosen location will be evaluated, based on wind data available in the literature, so that the technical feasibility of wind generation can be analyzed. To perform the fluid dynamics simulation, the ANSYS Software will be used, where initially several geometric profiles of helix and helical turbines will be studied to then define the type of mesh that best discretizes the wind turbine. From this work, it is expected to find a location with good wind potential in the northern region of Rio de Janeiro, where there is technical and economic feasibility for the installation of a plant; and verify the behavior of the wind turbine and its arrangement at the selected location

Keyword: wind energy; renewable energy; computational fluid dyamics.