Efficiency of cleaning photovoltaic solar panels using dew water and sensitivity to meteorological parameters

(Oral)

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ABSTRACT

In the current global context, many countries are facing water scarcity due to climate change, which has led to the gradual disappearance of certain forests and animal species. Moreover, photovoltaic solar energy producers generally use water from rivers, groundwater, or precipitation to clean solar panels. However, water scarcity poses a major threat to livelihoods and human well-being, particularly on the African continent. This situation has led to the implementation of various adaptation strategies. It also contributes to the degradation of solar panel surfaces, which are covered with glass to facilitate photon transmission and protect the cells from soiling. This soiling results from the accumulation of dust and dirt on the surfaces. Indeed, access to water for cleaning is often very limited and can be costly depending on the location. In some cases, water is available, but its long-term use for panel cleaning places excessive pressure on groundwater resources. Consequently, the use of dew water for cleaning solar panels appears to be a promising alternative solution, especially in arid and semi-arid regions. This experimental study aims to evaluate the effectiveness of cleaning photovoltaic solar panels using dew water. It involves exposing a glass plate, with the same thickness as that of a photovoltaic panel, under natural environmental conditions for a period of one year, on top of a building. The setup is designed with a variable tilt angle ranging from 0° to 30°, corresponding respectively to sunset and to the early morning before sunrise, after collecting the dew formed on the surface. Measurements of incident and transmitted irradiance are carried out regularly at times of maximum illumination. The results obtained made it possible to determine a significant average value of the surface transmittance rate, approximately 0.973 (97.3%). They also provided a better understanding of the influence of certain meteorological variables on dew formation. From this perspective, dew water appears to be a promising alternative solution for cleaning solar panels. It helps improve their performance while contributing to ecosystem protection and reducing water consumption for domestic needs.

Keywords: Climate Change ; Solar Panels ; Dew water ; Cleaning ; Meteorological Variables.